Santa Fe Super Shock Control

... page 19

ICC Locomotive Inspections

... page 26

RAILWAY
LOCOMOTIVES AND CARS

A SIMMONS-BOARDMAN TIME-SAVER PUBLICATION

FEBRUARY 1960

Alco Introduces 2,400-hp DL-640 ... page 17

CLASS

RF-333

Friction
Draft Gear

A super-capacity gear that has been service-tested and has UNLIMITED APPROVAL FOR APPLICATION to freight cars.

W. H. MINER, INC. CHICAGO

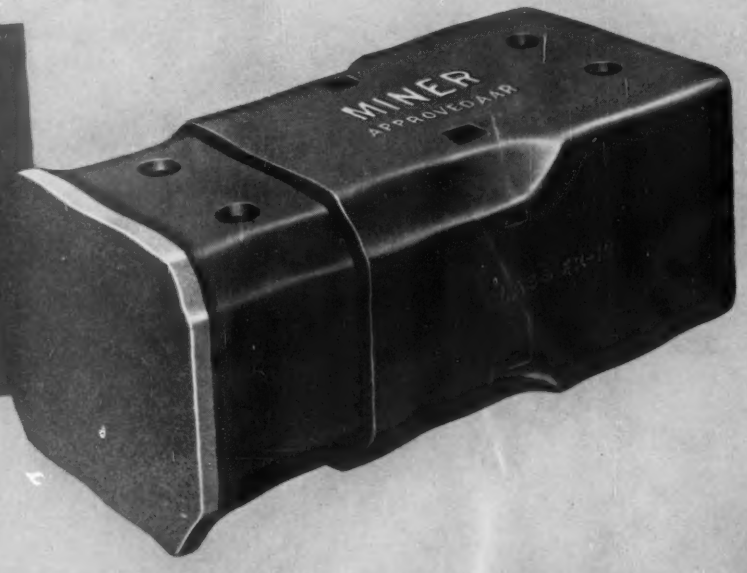
QUALITY

The Miner Class FR-19 Rubber Draft Gear is highly efficient, providing FULL-TIME PROTECTION to cars and lading. Self-contained, and no follower plates needed.

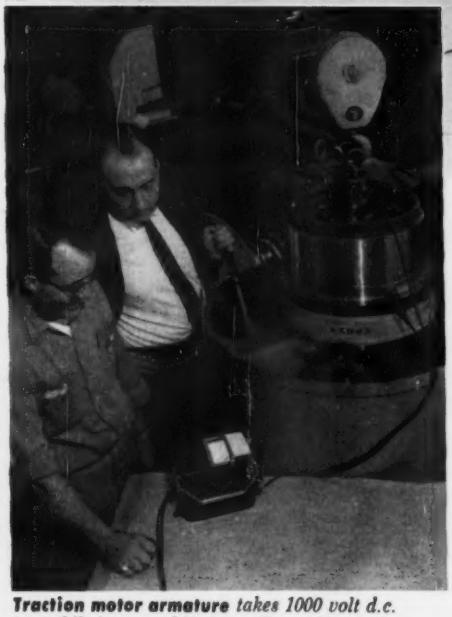
CLASS

FR-19

Rubber
Draft Gear



Snow and ice won't stop NECCOBOND-insulated motors— in stock for immediate shipment!



Traction motor armature *takes 1000 volt d.c. test while immersed in water. Even after weeks in water, there is no significant reduction in insulation resistance.*

SWIRLING SNOW makes a pretty picture but it's rough on traction motors. Dry, powdered snow has a way of seeping into motors, where it packs, melts and often causes insulation failure.

That's why National Electric Coil has developed its superior method of repair of your motors, using coils insulated with its NECCOBOND system, and armatures vacuum-impregnated in Epoxy resin. They do not ground out because of moisture.

We can rewind your armatures, repair your motors and generators, or exchange your units for our repaired ones. You'll be wise to make National Electric Coil a part of your equipment team. Call or write for full information.

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Redesigning and Repairing of Rotating Electrical Machines

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LOCOMOTIVES AND CARS

The Oldest Trade Paper
In the United States

February 1960—Vol. 134, No. 2

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REPORT FOR FEBRUARY

RE&MSA Exhibit June 13-16 at Frisco

The 43rd annual exhibit of the Railway Electrical & Mechanical Supply Association will be held June 13-16, inclusive, at the Jack Tar Hotel, San Francisco, in conjunction with the annual meetings of the AAR Mechanical Division and Electrical Section of the Engineering and Mechanical Divisions. New mechanical and electrical equipment, devices and ideas will be displayed.

Details concerning exhibit space can be had by writing to the Railway Electrical & Mechanical Supply Association at 919 N. Michigan ave., Chicago 11.

AAR Board Reviews Cars and Car Components

Establishment of an AAR Advisory Board on New Car Designs and Details has followed changes in Interchange Rule 3 included in the edition effective January 1, 1960. The new group consists of H. M. Wood, assistant chief mechanical officer (car), Pennsylvania; N. A. Passur, engineer car design and construction, Southern Pacific, and W. M. Keller, vice-president research, AAR.

The board will serve as a clearing house and act in an advisory capacity for railroads, car builders, and sponsors of new types of trucks and other major freight-car components. Untried design can be submitted for technical advice on developments that come within the scope of Interchange 3 as amended.

This rule, effective in the 1960 Code, states that no car of an untried type, whether built new, altered or changed, shall be offered or accepted in interchange, or accepted from the car owner, until its size, capacity and design shall have been approved by the Transportation and Mechanical Divisions of the AAR. The same principle applies to untried types of trucks, also major component, parts of car body where strength, interchangeability of parts, and general utility of the car are involved.

When contacted, the Board "will be able to make suggestions for improvements in the develpment of sound and worthwhile proposals which should be of much value to the sponsors. In other cases, its advice may point out unsound and unneeded developments before they proceed too far and ultimately result in financial loss to the sponsors."

Details, such as brake beams, draft gears, geared hand brakes, journal lubricating devices, metal running boards, and journal box lids, already have separate AAR approved procedures, and these will be continued.

New Solid Bearing Submitted to AAR Vote

Revision of the design for the standard solid journal bearing has been submitted to AAR member roads for letter ballot action. Research aimed at improving load distribution and other features of the bearing have been under study by the AAR Mechanical Research Department and several individual railroads and private car lines for several years. In submitting the letter ballot, it was pointed out that AAR Mechanical Research Report MR-310 showed that radial distribu-

(Continued on page 7)

TIME SAVING IDEAS FOR FEBRUARY

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GIVES LONG SERVICE AT WIDE RANGE OF OPERATING TEMPERATURES

Arapen RB 350 is another new Esso product designed to reduce railroad operating costs. Perfected by Esso Research, Arapen RB 350 is now available to offer you a combination of lubricating advantages required for anti-friction journal bearings.

Arapen RB 350 provides unexcelled lubrication from –30° to 250°. In the coldest weather, it remains soft and provides maximum lubrication. And at the highest temperatures, it provides a tenacious lubricating film needed under full-load conditions.

Arapen RB 350 passes the difficult 100,000 double stroke test without appreciable change in consistency. This remarkable sheer stability means Arapen RB 350 "stays put" without softening, gives excellent and long-lasting lubrication, reduces leakage through seals, requires less make-up grease.

For more information on the performance of this outstanding new grease, and for expert technical assistance available through an Esso Sales Service Laboratory, write: Esso Standard, Division of Humble Oil & Refining Company, 15 West 51st Street, New York 19, N. Y.

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tion of load was greatly improved by a raised area on the bearing back, and Report MR-349 showed that a change in fillet radius represented a further improvement.

As a result of laboratory and subsequent road tests, it has been recommended that the bearing be altered to incorporate the following:

- Length increased ¼ in., and additional increases in length of 3/32 in. be provided for each of the step-size bearings A-3 and A-5 to compensate "for increased lengths of journal on which such bearings are used;"
- Lug moved back 3/16 in.;
- Edges of bearing back depressed 1/16 in., leaving raised load pad in the center;
- Bearing and lining radii at collar end increased from ¾ in. to 13/16 in.;
- Bearing and lining radii at lug end increased from ⅛ in. to ¼ in.

The increase in length and the relocation of the lug will "not only reduce undesirable lateral motion in the journal-box assembly, but will also better equalize and reduce the wear at ends of both bearings and journals, thereby creating a definite saving," the AAR Lubrication Committee reported.

In the same letter ballot, it has been recommended that roller bearing Grease Specification M-917-56 be revised to include a procedure for determining rust preventive properties of greases submitted. This quality of grease would be determined by Coordinating Research Council Method L-41-957. The recommendation for change results from bearing failures which a member road attributed to corrosion of bearings and races.

A third proposition included in the ballot is a proposal for the adoption of an alternate standard 70-ton hopper-car design. The hopper was designed cooperatively by the Chesapeake & Ohio, Norfolk & Western, and Pennsylvania (RL&C, October 1958, p 22). Unlike the standard AAR hopper-car design, which incorporates inside stakes to obtain maximum cubic capacity, the new design has outside stakes which protect these structural members from corrosion initiated by ladings.

It was pointed out that "if this new design of car is approved, each road can exercise its own judgment as to whether to build this type of car, or the present design as now shown on Plate 601-G."

Orders and Inquiries for New Equipment

Placed Since the Closing of the January Issue

Diesel-Electric Locomotive Orders

Road and builder	No. of Units	Horsepower and type	Detail
CHICAGO & ILLINOIS MIDLAND: Electro-Motive	2	1,325 Road switchers	RS's. For September delivery.
GREAT NORTHERN: Electro-Motive	18	2,000 road switchers	GP-20's to replace 18 1,350-hp FT units.
MISSOURI PACIFIC: Electro-Motive	24	1,800 road switchers	GP-18's. For delivery April 15-June 30. Cost of units to be about $3,000,000, taking into account salvage value of 24 FT units to be turned back to builder and replaced by the GP-18's.

Freight-Car Orders

Road and builder	No. of cars	Type of car	Detail
AMERICAN REFRIGERATOR TRANSIT: Pacific Car & Fdry.	100	Mech. refrigerator	50-ft, 70-ton, steel sheathed, Class RP. Unit cost, approx. $27,000.
CANADIAN PACIFIC: National Steel Car	500	Box	50-ton, insulated.
CENTRAL OF GEORGIA: Ortner Co.	10	Flat	For delivery this month.
GREAT NORTHERN: Company shops	500	Box	50-ton.
SOUTHERN PACIFIC: American Car & Fdry.	100	Hopper	95-ton, open-top, with aluminum bodies and steel underframes. For spring delivery.
WESTERN FRUIT EXPRESS: Company shops	200	Box	70-ton, insulated.

Passenger-Car Orders

Road and builder	No. of Units	Horsepower and type	Detail
CHICAGO & NORTH WESTERN: Pullman-Standard	116	Double-deck, suburban	To have fluorescent lighting, air conditioning, and electric heat. Deliveries to start next September and continue at rate of 10 cars per month.

Notes and Inquiries

Chicago & North Western plans to spend another $21 million in a modernization program which, by early autumn 1961, will have the road's 40,000 commuters riding push-pull style. In addition to ordering the 116 cars listed above, the road will convert 45 locomotives and 48 pre-push-pull double-deck cars for bi-directional operation.

Milwaukee has authorized acquisition of 750 new freight cars, all to be equipped with roller bearings, at a cost of about $9,700,000. Program to include 500 50-ft, 70-ton wide-door box cars; 100 60-ft, 70-ton flat cars; 100 70-ton covered hopper cars; 50 50-ft, 70-ton box cars equipped with damage prevention devices. Will also rebuild 150 70-ton open-top hopper cars, 150 50-ton hopper cars, 125 gondolas and 150 ballast cars. Another 1,000 steel box and automobile cars and 74 gondolas will be upgraded.

Northern Pacific to spend approximately $20,000,000 for construction and purchase of 1,800 new freight cars in 1960, 825 of which will be equipped with roller bearings. Program includes 800 40-ft box cars with combination plug and sliding doors, and 100 40-ft refrigerator cars already under construction in company shops. Will also build 150 50-ft insulated box cars equipped with damage-prevention devices, and 150 50-ft box cars with 15-ft doors. Will purchase 25 65-ft gondolas, in addition to previously announced orders for 400 40-ft box cars from Pullman-Standard, 100 50-ft mechanical refrigerator cars from Pacific Car & Foundry, and 75 85-ft G-85 piggyback flat cars from General American.

Rio Grande may be operating diesel-hydraulic locomotives in about a year (RL&C, December 1959, p 8). Three 4,000-hp units have been ordered from a German manufacturer. Reports put the cost of the order at about $1,000,000.

Santa Fe to acquire 50 new baggage cars and about 2,500 new freight cars during 1960.

ICC Reports on Power Brake Observations

First results of observations made under the Power Brake Act of 1958 by ICC inspectors showed 67.6 per cent of freight train air brake tests were properly made. Reports on the observations of air tests of 2,692 freight trains composed of 176,909 cars were included in the annual report just issued by the ICC Section of Railroad Safety, Bureau of Safety and Service, for the fiscal year ended June 30, 1959.

The Power Brake Act was effective on August 9, 1958. Through the next eleven months, the Section's inspectors also observed brake tests conducted on 153 passenger trains and rated 144 of these as "proper." Observations of shop and repair track activities, authorized by the Power Brake Act, showed that 90.9 per cent of the 935 air brake operations were properly conducted. Inspectors covered 164 railroads in making their freight train, passenger train, and shop track observations.

The 1959 record for safety appliance defects found per thousand units inspected was the lowest of any of the past five years. A total of 1,291,971 freight cars, passenger cars and locomotives were inspected and 59,056—4.57 per cent—were found defective. Of the 1,183,040 freight cars inspected, 4.81 per cent were found defective. For passenger cars, the percentage was 5.23, and for locomotives, 1.28.

Summaries indicated that the number of air brake defects dropped from 18,533 in 1958 to 7,434 in 1959. The average freight train inspected contained 65.7 cars in 1959. Comparison of the two years' defects showed:

	1958	1959
Brakes cut out or defective	2,975	1,608
Excessive piston travel	7,727	3,573
Not cleaned within required time	7,831	2,253

The Section report pointed out that the large decrease in the "out of date" classification resulted from extension of the AB cleaning period from 36 to 48 months on August 1, 1958.

Commenting on the transportation of explosives and other dangerous commodities, the Section reported that "activities of commercial shippers and government agencies dealing with the development of missiles, rockets, chemicals and dangerous goods continue to create new problems of transport packing. . . . Trends toward adoption

(*Continued on page 50*)

longer life

for your diesel locomotives

with cleaner intake air

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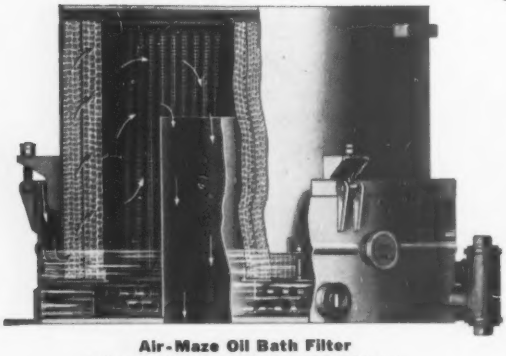
Oil Bath or Panelbath Filters



Air-Maze Oil Bath Filter
Efficient filtration with low maintenance.

Air-Maze Panelbath Filter
Effective filtration at low initial cost.

Which should you use? *One or both of these Air-Maze filters is the economic answer to your locomotive fleet requirements. Evaluate the advantage of each filter under your operating conditions.*

OIL BATH FILTER—Removes up to 97% of objectionable dirt... has exceptionally high dirt-holding capacity... requires only semi-annual oil changes and annual removal for cleaning.

PANELBATH FILTER—Removes up to 90% of objectionable dirt. Designed to up-grade panel filtration of intake air, the PANELBATH has low initial cost... replaces 2" and 4" oil-wetted or centrifugal type panels on engine air intakes. Requires periodic servicing at 90-day intervals under average operating conditions.

Replaces panel filtration with resultant efficiency at least equal to that replaced.

The basic principle used in both these Air-Maze filters is backed by successful service on over 4000 locomotives.

For further information, contact your locomotive builder or write Air-Maze Corporation, Dept. RL-2, Cleveland 28, Ohio. (Subsidiary of ROCKWELL-STANDARD CORP.)

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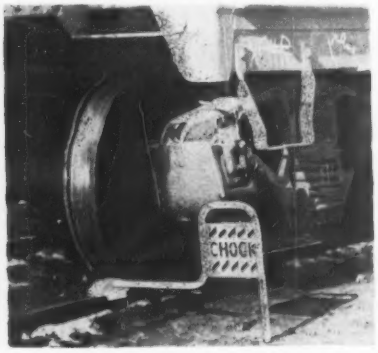
Welding Gun

The Aircomatic Model AH60-B air-cooled gun has a continuous duty rating of 600 amp d.c. when using "buried arc" CO_2 techniques. It is manually operated and can accommodate hard welding wires from .035 in. through 3/32 in. fed from conventional Airco wire feeders.

The gun has a lever type trigger for simple operation, and a goose-neck nozzle assembly for use in hard-to-reach areas. Cable connections have been reduced by combining both power cables and wire casing. No tools are needed for assembly of the gun. *Air Reduction Sales Co., a division of Air Reduction Co., Dept. RLC, 150 East 42nd st., New York 17.*

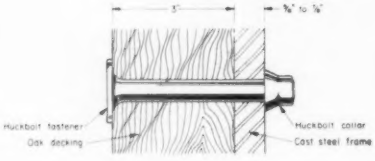


Wheel Chocks

Aldon wheel chocks are said to provide safe and effective blocking of all rolling stock and to prevent derailment should equipment be rolled over the chock. The chocks have tool-steel insert spurs which bite into the rail head as wheel pressure increases. Four styles meet the needs of exposed or flush set rails. Safety grip handles permit easy setting or removal, without tools. The flag type, finished in maintenance-of-way yellow, can be used on either side of track and in either direction. Car inspector's blue is available on special order. *Aldon Co., Dept. RLC, 3338 Ravenswood ave., Chicago 13.*

Molybdenum Disulfide Lubricant

Molykote M-55-Plus is a molybdenum disulfide lubricant for extreme pressure applications—on drills, taps, cold-metal forming dies, punches, etc. It is said to out-perform its predecessor, M-55 (5 per cent EP dispersion in medium oil) by 116 per cent in welding load tests and 71 per cent in wear resistance tests. *Alpha-Molykote Corp., Dept. RLC, 65 Harvard ave., Stamford, Conn.*



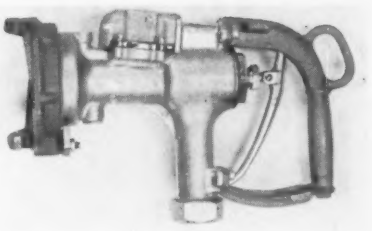
Tensile Preload Fasteners

Preloaded Huck bolt fasteners are being used in the Decatur, Ill., shops of the Wabash to attach oak decking to cast-steel flat-car frames. The fasteners replace head-sealing bolts locked in place with patented clinch nuts. Oak decking 3 in. thick is joined to the cast-steel flat-car frame by a ½-in. diameter flat head Huckbolt fastener. Sealing is achieved by the tensile preload built into the fastener as installed. The collar is swaged into locking grooves on the Huckbolt pin, positively locking the fastener in place and insuring retention of the design preload in service. *Huck Manufacturing Co., Dept. RLC, 2480 Bellevue ave., Detroit 7, Mich.*

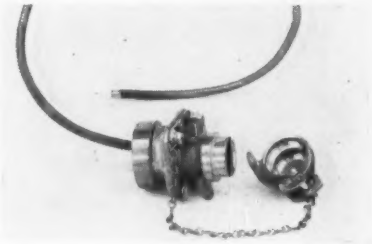
Multi-Purpose Vacuum Cleaner

Air-Vac, a multi-purpose air-operated vacuum cleaner, for use with compressed air or steam, may be used for cleaning railroad cars, machine tool and paint-spray booth sumps, etc. High vacuum and suction are attained through a Venturi air-jet system, which eliminates electric motors and moving parts, as well as maintenance and fluctuations in vacuum. The unit can pick up liquids at rates up to 2 gal per sec, and dry materials, such as sand, at rates up to 125 lb per min. Fluid lift is 25 ft.

Materials, wet or dry, picked up by the cleaner are deposited into a 55-gal drum or similar container. Four sizes of hoses, from 1½ in. to 4 in., permit the machine to be used for any cleaning or conveying job. The cleaner weighs only 35 lb. For specialized applications, multiple heads are available. *Kimco Products Co., Dept. RLC, 413 Johnson st., Jenkintown, Pa.*



Automatic nozzle



Adapter

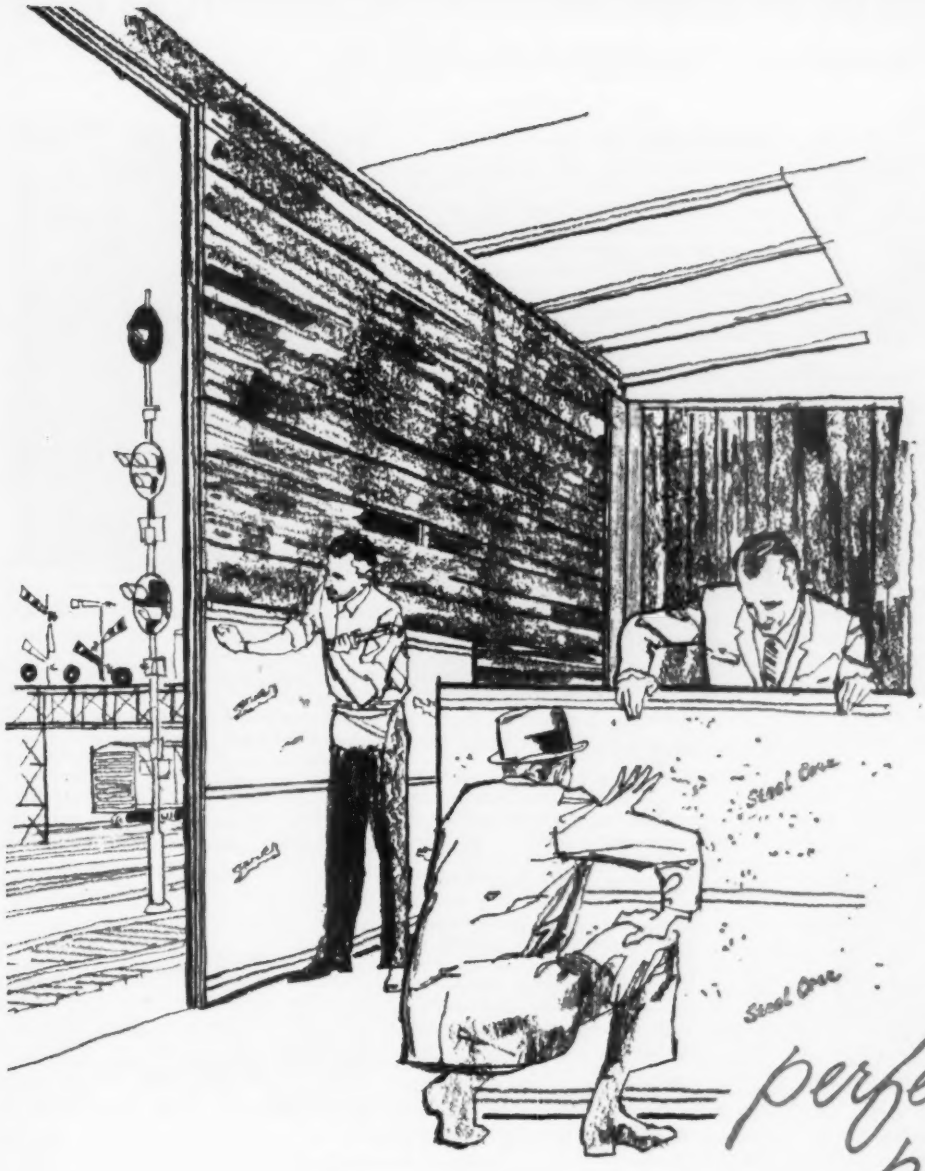
Automatic Diesel Refueling System

The nozzle of the Buckeye system of automatic diesel refueling is based on the Buckeye Safety-Fill which shuts off automatically at the main valve when the fuel reaches the end of the spout. One size of nozzle handles pump ratings of 100 gpm or greater per hose and operates satisfactorily on flows down to 65 gpm. A smaller nozzle handles pump ratings of 75 gpm per hose or less, down to 15 gpm. Both nozzles have a manual override and are constructed of anodized aluminum. Shutoff is gradual; surge proof.

The adapter assembly of the system is mounted on each fueling connection on the locomotive by removing strainers and using the existing screwed fittings. The adapter contains no moving parts. Two flexible brass tubes—a short shut-off tube mounted inside a larger tube called the quieting tube—project from the rear of the adapter flange into the fuel tank. When the fuel in the tank rises to the end of the inner shutoff tube, air flow is stopped. This action triggers the shut-off valve in the nozzle, stopping the fuel flow. Operation is based on the Venturi principle.

Railroads using the automatic diesel refueling system—the Southern, Detroit & Toledo Shoreline, Central of Georgia, Erie, and Delaware & Hudson—report less fuel waste, reduction in clean-up costs, and more efficient use of manpower through its use.

Special coupling units permit locomotives not equipped with Buckeye fueling adapters to be fueled manually with the automatic nozzle. Locomotives equipped with the adapters can also be fueled with a conventional nozzle. *Buckeye Iron & Brass Works, Dept. RLC, Dayton, Ohio.*



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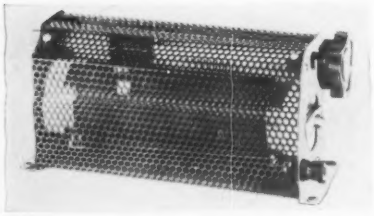
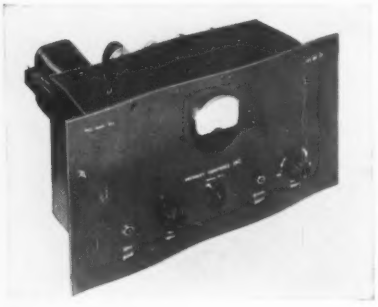
WHAT'S NEW IN EQUIPMENT—(Continued from page 10)



Caged Rheostats

Metal cages completely enclose live and hot parts of the 10-in. Lubri-tact screw-drive caged Jagabi rheostats which are suitable for use in shops, testing departments, or laboratories.

The cages are attached to pre-punched end brackets and enclose the top, sides, and bottom of the rheostats. New type perforated material allows 50 per cent more open area than older types, thus affording more efficient cooling. The cages can be added in the factory or in the field. Mounting dimensions are the same as for open rheostats, except for a slight increase in slider height. *James G. Biddle Co., Dept. RLC, 1316 Arch st., Philadelphia 7.*



Electronic Sensing Control

The Model 400 Security electronic sensing control detects, counts, measures and recognizes metallic and non-metallic objects, without physical contact, as they enter a capacity field. The device consists of a sensing element or probe, of any form or size, connected by coaxial cable to the electronic control, and can be set up to any given constant at a given time interval. Detection is expressed in the stopping of a machine, by actuating a rejecting or corrective device, or by signaling for action. To detect the presence of water or babbitt in lubricating oil in diesel locomotives, a special probe with two vessels is used. One vessel contains tested oil; the other, untested oil. The meter indicates whether the oil is suitable for further use or if it should be changed. *Security Controls, Inc., Dept. RLC, 503 Franklin st., Buffalo 2, N. Y.*

Electric Hydraulic Presses

Two motorized hydraulic presses, which complement the 150-ton electric hydraulic press (RL&C, Nov. 1959, p 65), are designed to handle jobs requiring pressures of 60 and 80 tons, respectively. Frame members are fabricated from selected structural steels, and their rams are ground to obtain a 16-micro-inch finish. Work tables can be moved through a wide range of travel by a self-locking, worm-gear reduction winch. *Acco Equipment Div., American Chain & Cable Co., Dept. RLC, York, Pa.*

Derusting Tool

The Vonarx air gun operates on compressed air from any industrial type of compressor for derusting, cleaning and descaling operations. Spring loaded recoil action controlled by a trigger on the handle moves a series of hardened steel needles in the head of the gun. The flow of air released sets the needles into rapid back-and-forth action, and air continues on through the gun, blowing the working surface clean. Because each operates independently, the needles adjust to the contour of the surface being cleaned. Needle life is approximately 200 to 400 hr. Normal working air pressure is 88 psi, and air consumption is 12.5 cfm. Model IIB weighs 5½ lb; Model IIIB, 8½ lb, and Model IVB, 13 lb. *Swissair Tool Corp., Dept. RLC, 7775 Sheridan Drive, Buffalo 26, N. Y.*

Airless Spray System

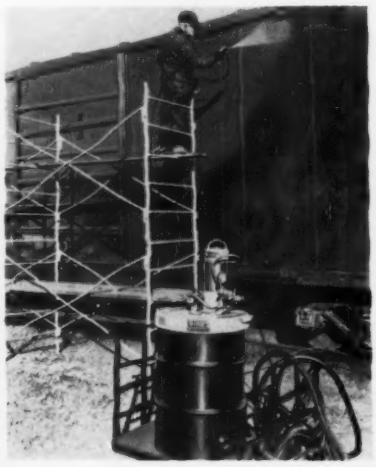
An airless spray system especially suited for painting structures and rolling stock uses no air in the atomization of paint. High working pressures atomize paint to a fine mist as it passes through the spray-gun orifice. Overspray and paint waste are said to be greatly reduced and open-air painting made easier.

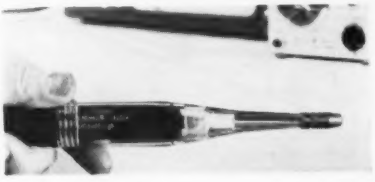
With either of two basic systems—a 55-gal unit and 5-10-gal unit—paint is taken from the original container through the Pacer 300 high-pressure air-operated pump which has a 30-1 ratio. The pump delivers working pressures up to 3,000 psi, with enough volume to supply two spray guns if needed.

The system is equipped with nylon pressure fluid hose with reusable hose fittings. Stainless steel hose may also be had.

Spray gun Model 39 is especially designed for use with the system. It has a tungsten carbide tip.

Either system may be operated from permanently installed compressed air systems, or from pressure from one of several Binks portable air compressors. Minimum and maximum operating air pressures (input to pump) are 35 and 110 psi, respectively. *Binks Manufacturing Co., Dept. RLC, 3114 W. Carroll ave., Chicago 12.*





Halogen Leak Detector

A portable electronic leak detector equipped with a special probe is available for locating refrigerant leaks where concentrations of halogen compounds, such as refrigerants, paints and varnishes, may be present in the air. The kit, packaged in a compact leather case, consists of a Type H-6 leak detector equipped with a newly designed proportioning probe, and a Type LS-20 leak standard. By twisting an adjustment on the probe at its tip, varying amounts of pure air cleaned by a built-in filter, can be mixed with the air being drawn through the probe. This "dilutes" the air being tested so that halogens present in the atmosphere will not be detected. The leak detector, however, is said to remain fully sensitive to all refrigerant leaks of ½ oz a year and larger. *General Electric Co., Dept. RLC, Schenectady 5, N. Y.*

EDITORIALS

Diesel-Hydraulic Locomotives

The performance of the high-horsepower Krauss-Maffei diesel-hydraulic units on American rails will be watched with keen interest. Performance alone will determine whether the hydraulic transmision can meet the operating requirements of American railroads for main line freight service.

This type of motive power has gained rapidly in popularity in Western Europe for both passenger and freight service. About 300 units of 1,500 to 3,000-hp capacity are in operation or on order there. The three units reported to have been purchased by each of two western American roads, one the Denver, Rio Grande & Western, are indicated to have 4,000-hp power plants.

No specifications have been released for these locomotives but they are expected to be similar to the 3,000-hp Krauss-Maffei diesel-hydralic locomotive operating on the German Federal Railway since June, 1958. This unit was built originally in 1957 with two 1,100-hp engines. These were replaced by two 1,500-hp engines in 1958. According to Diesel Railway Traction this prototype locomotive had operated 60,000 miles in freight service up to June, 1959.

Proponents of the hydraulic transmission claim that it has advantages of weight per horsepower, adhesion and the dissipation of the heat generated by transmission inefficiency. The combination of lightweight engines and hydraulic drive along with superstructures and trucks of lighter weight give the European locomotives the advantage of high horsepower per ton. This power is particularly suitable for lightweight trains operating on high-speed schedules. It remains to be seen whether this power can handle the freight trains here where higher operating costs make it necessary to increase train tonnage in order to decrease the cost per ton.

With the hydraulic transmission all wheels in each truck are mechanically coupled. This arrangement gives it an adhesion advantage over the diesel-electric because motor-driven wheels are isolated mechanically from each other. It is claimed that the diesel-hydraulics produce tractive force at the drawbar of 22 to 27 per cent adhesion at 13 to 16 per cent of maxium speed. Comparison is made with the diesel-electric showing 16 to 17 per cent at the drawbar at 20 to 32 per cent of top speed.

The efficiencies of electric and hydraulic transmissions are comparable. But advocates of hydraulic transmissions point out that the heat generated due to transmission inefficiencies can be dissipated more simply and readily with hydraulic than with electric transmissions. They say that the electric transmission requires high-grade insulation, epoxies and blowers to handle the heat generated in heavy freight service. In contrast, they show that relatively simple heat-exchangers can take care of the heat generated in hydraulic transmissions under most adverse conditions.

Whether or not the hydraulic transmission can justify the claims made for it under the tough operating conditions imposed on locomotives in this country is a question that only service tests can answer.

Automatic Enough?

Automation of certain phases of train operation may not be too far off, if recent developments do indicate a trend. Recently we reported that experiments were under way on a western railroad with a crewless helper locomotive operated by radio from the locomotive at the front of the train. At least two U.S. roads have installed remotely controlled units to perform trimming operations at major classification yards. For some time the New York City Transit Authority has been developing equipment which will permit it to run shuttle trains without operators.

Perfection of various techniques for starting, stopping, and controlling train speeds from remote locations points to a time when it may be possible to operate certain types of trains without crews. This could make some railroad operations similar to those of pipe lines. Pipe line operators feed large slugs of various liquid commodities through their cross-country lines in succession. They may be introduced and removed at terminals or at intermediate way stations. The progress of a specific commodity enroute can be monitored.

Certainly extension of this fully automated technique to railroading is many years off, but present research and future planning should be aimed at introducing as much automation as practicable wherever and whenever it is proved feasible. Technological progress in this field can eventually come against a rather formidable obstacle.

The problem could be that of assembling cars into trains which are subsequently to be operated automatically, and disassembling these trains at their destinations. The "automatic coupler used on this continent is, in reality, only an "automatic uncoupler." During coupling, it proves to be automatic only if properly aligned and if the knuckle is open. In automatic classification yards in which car reporting, car inspection, and car classification are done at high speed, time must still be allowed for the coupling of air hoses on trains when they are ready to be moved out.

Currently the British Railways has a program to develop an automatic coupler which will be essentially self-aligning and will include an integral train line connection for the vacuum brake. This will represent a jump from the ancient "hook" coupler, the present British standard, to something somewhat better fitted for automation than the current American coupler.

Changing of such a standardized component as the coupler would require many years and much preliminary work. However, if something is not done in this field, it is possible that railroads may find future progress impeded by one "hand" job in an otherwise automatic operation.

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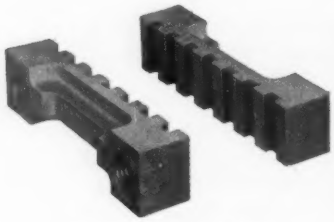

Magnus R-S Journal Stops

Magnus Traction-Motor Support Bearings

YES, Magnus is in the railroad bearing business—has been almost from the days of the Tom Thumb! And during this century of specialized service, Magnus has pioneered many significant advances in bearing metallurgy and design—to provide better bearing performance at lowest possible cost.

For example, the recently-introduced Magnus R-S Journal Stops have given railroads the first truly low-cost solution to the hot-box problem. By taking the "slop" out of the journal box, R-S Journal Stops prevent excessive displacement or lifting of the bearing—even under the most severe braking and switching impacts. They increase bearing life 200 per cent, reduce wheel flange wear, protect dust guards—cut operating costs all along the line. Magnus lubricators provide another important link in the chain of improved bearing performance. And in diesel-electric and electric locomotives and MU cars, modern Magnus traction motor support and armature bearings assure trouble-free mileage between motor overhauls.

And Magnus is keeping a weather eye on the *future*, too. With this background of railroad experience, Magnus is continually developing and testing new designs of journal box components for still greater efficiency and economy in railroad service. Whatever the future may hold, of this you can be sure. Tomorrow's rolling stock will ride on Magnus bearings—bearings that are *right for railroads* in performance and in cost. For further information on Magnus bearing products, write to Magnus Metal Corporation, 111 Broadway, New York 6, or 80 E. Jackson Blvd., Chicago 4.

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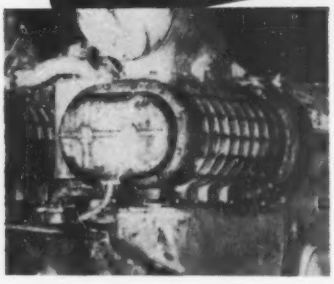
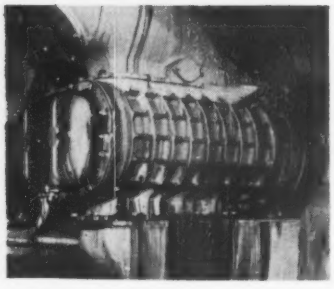
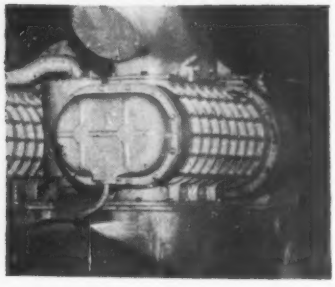
DIESEL CLEANERS



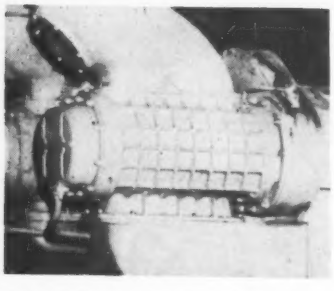
Take a dirty diesel...



spray it with LIX...



rinse it with water...



get a "clean-as-new" surface.

If you're serious about wanting to reduce maintenance costs, **switch to LIX** and cut your diesel cleaning costs! Efficiency comparisons have proved to road after road that Lix Diesel Cleaners do clean the whole engine or any parts BETTER and FASTER . . . cut man-hours 'way down.

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Behind each Lix Cleaner — for spray or tank-soak use — are years of railroad cleaning experience, combined with constant research.

A Lix railroad-cleaning specialist will gladly survey your needs . . . give you complete information on modernizing your cleaning . . . and, so that you can see for yourself how Lix cuts time and labor costs, he will give you a DEMONSTRATION in your shop — without cost or obligation.

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2262

Compact 128-ton diesel freight locomotive unit is first 2,400-hp unit offered with only four traction motors and four axles.

Alco DL-640: Power for Fast Freights

Four-motor, four-axle road switcher is rated at 2,400 hp; unit has been designed for high-speed freight service

Since early last month, the first five units of Alco's newest type of 2,400-hp road switcher have been in test service. By the end of April, these five units will have made demonstration runs on 22 U.S. railroads. The importance which Alco Products associates with faster freight service is shown by this new design which has been tailored specifically for high-speed freight train assignments.

For the first time, a four-motor, four-axle 2,400-hp locomotive is being offered to U.S. roads. With railroads striving to reduce running time on priority freight schedules, this locomotive offers the motive power necessary for the job, Alco claims.

Six years ago Alco introduced its first six-axle, six-motor road switcher —the DL-600. Since then the rating of the DL-600 has been brought up to 2,400 hp from its original 2,250 hp. In designing the DL-640, Alco has not mounted the DL-600 carbody on four-wheel trucks, but has produced a new underframe and altered the superstructure.

Redesign of the carbody includes a reduction in overall length. While the DL-600 is 66 ft 7 in. between coupler pulling faces, the DL-640 is only 57 ft 2½ in. There is no space in the latter for a steam generator. In place of the conventional full-height, short hood used on most road switchers, the DL-640 has an abbreviated low hood and "picture window" windshield similar to that used on most recently-built DL-600's (RL&C, August 1959, p 46). The hood houses auxiliary equipment, sand boxes and toilet. Collision

posts are incorporated in the structure.

The DL-640 has an Alco 251 Vee-type, 16-cylinder diesel engine. This turbosupercharged, 9 x 10½-in. engine is coupled to a General Electric GT-581 main generator. Output is controlled by a Type MG-8 power plant regulator. Four GE-752 traction motors are mounted in the two swing-motion, pedestal-type motor trucks. Alco is offering three gear ratios for the DL-640:

Gearing	Continuous tractive effort, lb	Maximum speed, mph
74:18	50,000	65
65:18	44,700	75
64:19	41,600	80

With only four traction motors, the locomotive does not have the high continuous rating possible with the DL-600. However, the DL-640 is capable of a slow-speed performance comparable to that of a four-motor Alco 1,800-hp road switcher. On the other hand, the power characteristics will enable three of the DL-640's to equal the high-speed performance of four of the 1,800-hp DL-701's. Dynamic braking is available as a modification on the DL-640. The braking unit is installed over the diesel engine.

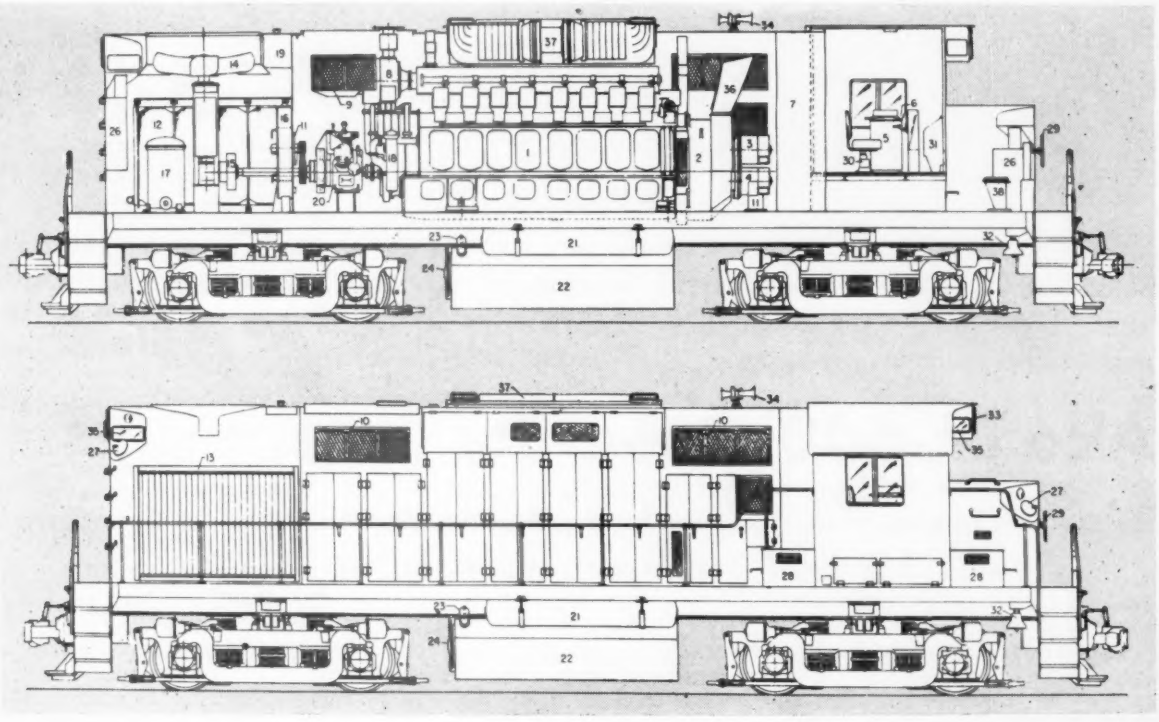
Radiators for the cooling system are at the rear of the unit in a standard Alco arrangement with cooling fan driven through an eddy-current clutch and right-angle drive unit from the diesel engine. The two-stage, three-cylinder air-cooled air compressor has a displacement of 315 cfm at full engine speed of 1,025 rpm, and a displacement of 123 cfm at the idling speed of 400 rpm. Brake equipment is 26-L.

Alco claims that performance of the DL-640 is comparable to that of the DL-600 at all speeds above 15 mph. With only four motors instead of six, the first cost is lower. In addition, it is expected that maintenance costs will also be reduced.

After shake-down runs on the Delaware & Hudson, the first three DL-640 units went into high-speed freight service on the New York Central between New York and Chicago. For the demonstration runs, over the next three months the five DL-640's will operate in combinations of three and two units.

General Characteristics

Height, max., ft-in.	13 - 3
Height, over cab, ft-in.	14 - 6
Width, max., ft-in.	10 - 1⅝
Length, inside knuckles, ft-in.	57 - 1½
Wheel base, total locomotive ft-in.	40 - 4
Maximum track curvature, deg:	
MU or with train	30
Single unit without train	39
Weight, lb	256,000
Lubricating oil, gal	250
Fuel oil, gal	2,000
Engine cooling water, gal	320
Sand, cu ft	28



1. Engine
2. Main generator
3. Exciter
4. Auxiliary generator
5. Control compartment
6. Brake valves
7. Control compartment
8. Turbosupercharger
9. Turbosupercharger filters
10. Air filters
11. Traction-motor blower
12. Radiator
13. Radiator shutter
14. Radiator fan
15. Radiator fan clutch
16. Lubricating-oil cooler
17. Lubricating-oil filters
18. Lubricating-oil strainer
19. Engine water tank
20. Air compressor
21. Main air reservoir
22. Fuel tank
23. Fuel-tank filling connection
24. Fuel-tank gage
26. Sand box
27. Sand-box cover
28. Batteries
29. Hand brake
30. Cab seat
31. Cab heater
32. Bell
33. Headlight
34. Horn
35. Number box
36. Generator air-intake duct
37. Dynamic brake blower and grids
38. Toilet

Sante Fe Super Shock Control

Cushioning unit with higher energy absorbing capacity is incorporated in first three cars

Results of the Santa Fe's continued research and tests to improve cushioning qualities of its shock-control underframe have been incorporated in new types of cars. Super-shock control, which allows for 18 in. of cushioned travel in buff and draft impacts, has been installed in two experimental 53-ft 6-in. flat cars recently released for service. One of the cars, a double-deck design, will be handling new automobiles from Detroit to the West Coast. A 50-ft 6-in. insulated box car is also being equipped with super-shock control. Santa Fe officers are closely following the service results and customer reactions to these cars, which will be assigned to movements of readily damaged commodities.

The original shock-control units were installed in 1958 (RL&C, October, 1958, p 21). Since then, the Santa Fe has installed the 10-in. travel shock-control underframe on a total of 1,700 box cars.

Double Acting

The shock-control unit is a double-acting hydraulic piston and cylinder arrangement carried in the sliding center sill and reacting against the fixed sill which is part of the car's underframe. In a cushioning unit, the greater the travel embodied in the arrangement, the greater will be the cushioning effect. Early designs in which buff and draft loads were absorbed by heavy coil springs resulted in structural damage and undesirable recoil.

Research which resulted in the development of the shock control underframe was based on a five-point program set up by Santa Fe officers to provide:

- Protection to lading from impact speeds up to 12 mph or higher;
- A high-capacity cushioning device which would introduce little or no recoil and which would allow a considerable amount of travel of the sliding sill at all impact speeds, the unit to be of simple construction, easily applied, and very rugged;
- A rugged underframe with as much travel of the sliding sill as allowable;
- A sliding sill which would return to its normal position after impact in as short a time as possible without introducing recoil into the system;
- Draft gears which would protect the sliding sill and coupler.

According to T. T. Blickle, general manager—mechanical department, the hydraulic cushioning device appeared to be the best choice from the standpoint of smooth operation, high capacity, lack of recoil, and adequate travel at all impact speeds.

The hydraulic device developed consisted of a high-pressure, double-acting piston and cylinder contained within a low-pressure housing which acts as a reservoir for the fluid. In the design, an inner cylinder head is utilized to confine the high-pressure fluid within the cylinder in order to eliminate the need for the piston-rod packing to seal against high pressures, and a spring-loaded V-ring (chevron) type packing is used to seal the low-pressure housing around the piston rod. The normal position of the double-acting piston which has a maximum of 10 in. of travel in each direction is at the center of the cylinder. Orifices in the cylinder wall control the flow of the hydraulic fluid, and are spaced to provide the desired cushioning as the piston moves toward either end of the cylinder during impact. Return spring assemblies are mounted at the bolsters.

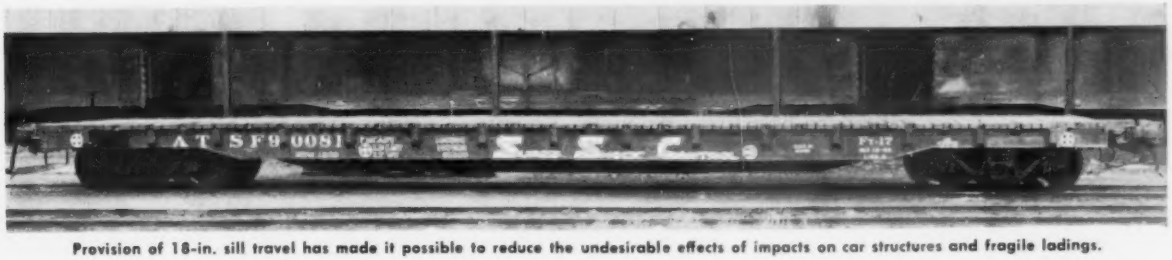
New Design

The new super-shock control unit has practically the same cross-sectional dimensions as the unit having 10-in. of travel, but is longer and has an orifice pattern conforming with the greater travel. Orifices are spaced so as to produce as nearly as possible a rectangular shaped force-travel diagram.

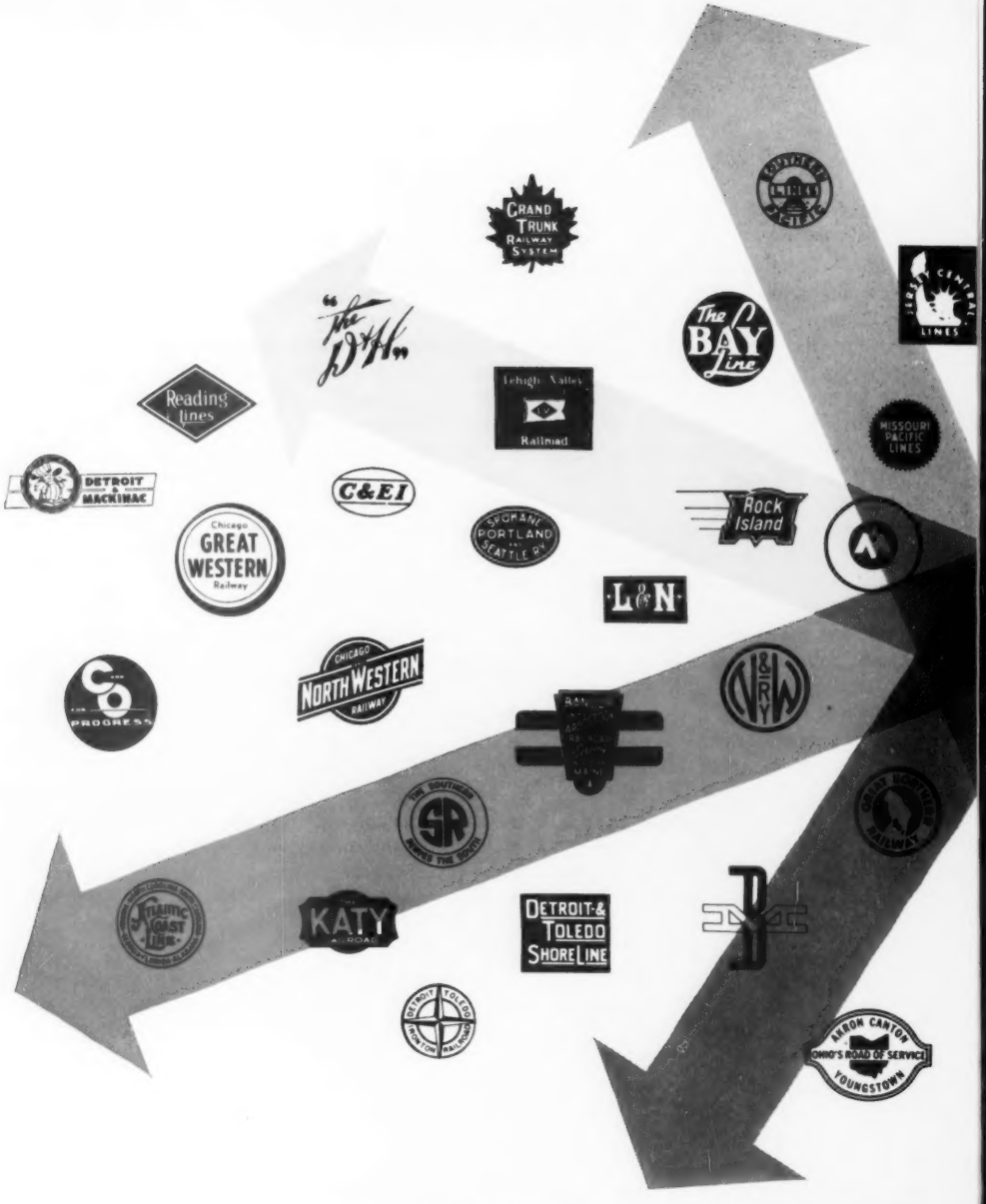
A hydraulic device of this type has the inherent characteristic that cushioning force increases in proportion to impact speed. This allows a large portion of the designed travel to be used up at the lower coupling speeds as well as at the high speeds. This serves to give maximum protection to car and lading at all impact speeds. There is no damaging recoil.

Tests were made on the super-shock control flat car loaded to 169,000 lb gross weight and striking a car of the same weight. Data shows the coupling impact induced in a conventional car at the regulation switching speed of 4 mph is not produced in the car with super-shock control until the coupling speed reaches 14 mph. This compares with a speed of 9.5 mph in cars with the 10-in. travel shock-control units.

(Continued on page 48)



Provision of 18-in. sill travel has made it possible to reduce the undesirable effects of impacts on car structures and fragile ladings.



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If it is, you're in good company. Each of these railroads utilizes modern freight car equipment to increase operating efficiency and promote customer satisfaction. Seventy-two users, we're proud to say, have chosen N-S-F products to help them do those two essential jobs.

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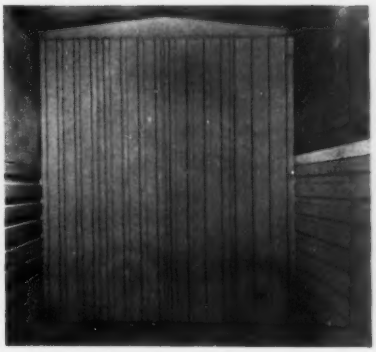
NAILABLE STEEL FLOORING, with its unique nailing grooves for secure blocking, has been reducing maintenance costs and increasing load versatility for thirteen years. Over 75,000 cars are equipped with N-S-F to carry all types of lading—rough, sacked, finished or bulk.



STRAN-STEEL ANCHOR LINING, extending to various heights on the sidewalls and to the full length of the endwalls, protects these vital areas against the damage which commonly causes 70% of rip-tracking. Recessed strap anchors make bracing of lading quick and secure.

GRAIN DOOR NAILERS, used with either sliding or plug doors, adapt the nailable steel principle to a formerly vulnerable section of the car. They strengthen doorways and permit repeated nailing of grain doors without ever splintering or weakening the nailers.

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NEW GULFCROWN R.R.

Now you can insure extra protection for your investment in roller bearing equipped railroad cars, with a new Gulf grease developed specifically for this purpose.

New Gulfcrown R.R. is a lithium base grease especially formulated for improved lubrication of roller bearing journals. It has been tested and approved under A. A. R. Specification No. M-917-56.

Stands up at high temperatures. New Gulfcrown R.R. has been used successfully in bearings operating at temperatures as high as 250° F.

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Won't thin out at high speeds. Its excellent mechanical stability keeps Gulfcrown R.R. from thinning out under the churning action of high speed bearings.

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Resists washing action of water. Gulfcrown R.R. also provides effective protection against rust.

Excellent oxidation stability. New Gulfcrown R.R. Grease is effectively inhibited against oxidation to insure long life, both in storage and in use.

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Dept. DM, Gulf Building
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GULF

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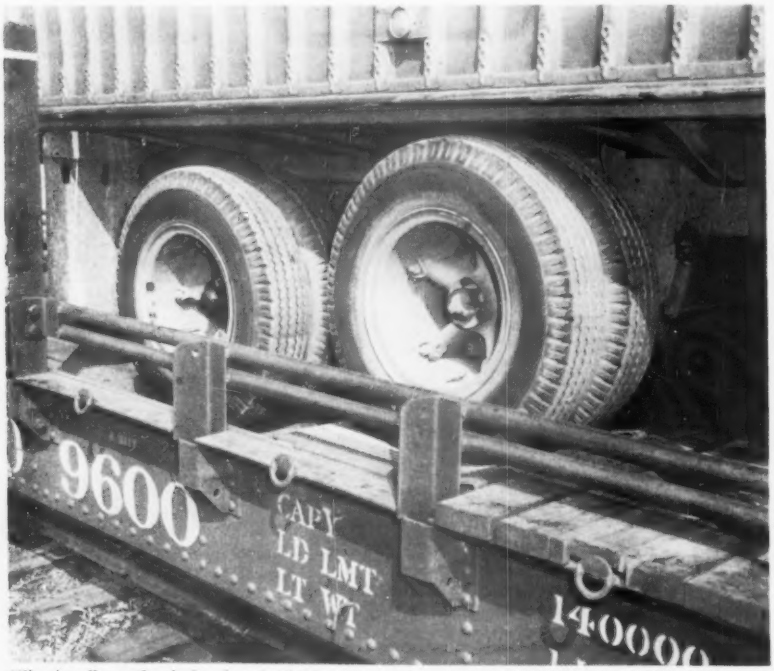
Hook and eye over the uncoupling lever handle were needed to "articulate" these B&O piggyback cars. Road has a total of 35 of these 2-unit cars. The 85-ft cars can be operated over many parts of the system. Washington-St. Louis line has clearance restrictions.

B&O 'Articulates' Piggyback Cars

Solution of clearance problems and the ability to quote competitive rates resulted from development

ARTICULATION of two 53-ft 6-in. piggyback cars and construction of trailer wheel wells on their decks have enabled the Baltimore & Ohio to solve a serious clearance problem and quote competitive rates for two-trailer movements. Assignment of 75-ft and 85-ft cars to this service would have complicated the clearance problems because of overhang on sharp curves. The shorter wheelbase and 41-in. deck on the 53-ft 6-in. cars produced the best clearance combination.



Wheel wells on the decks of each of the two units drop trailer tires, reducing overall height within the clearances imposed by tunnels on "tight" sections of B&O main line.

A total of 35 of the two-car units are now in service. The "articulated" connections between the pairs of units are actually standard AAR couplers with locks on the uncoupling levers to discourage separation during normal operations. On the first cars converted, a lock was applied to the coupler as well as to the uncoupling lever. Although the B&O thought it had sufficient background with locking couplers on other equipment, the ICC took exception to this arrangement for two-unit piggyback cars. After a conference, it was agreed to discontinue the lock on the coupler lift. The lock on the uncoupling lever can be opened readily.

The wheel wells for trailer tandem axles are 8⅜-in. deep This makes it possible to handle trailers with an overall height of 11 ft 9 in. on the most restrictive portion of the B&O St. Louis line and to handle 12-ft 6-in. trailers on other parts of the system. B&O said the modifications have made it possible to reduce operating costs without expensive purchases of new equipment. The development makes it unnecessary to re-route high trailers.

Simplification of wheel-stock problems and reduced inventory have lead GN to undertake program which will put roller axles on all EMD switchers.

Solid Bearings Ride on Roller Races

Great Northern switching locomotives are being equipped with combination of bearing components

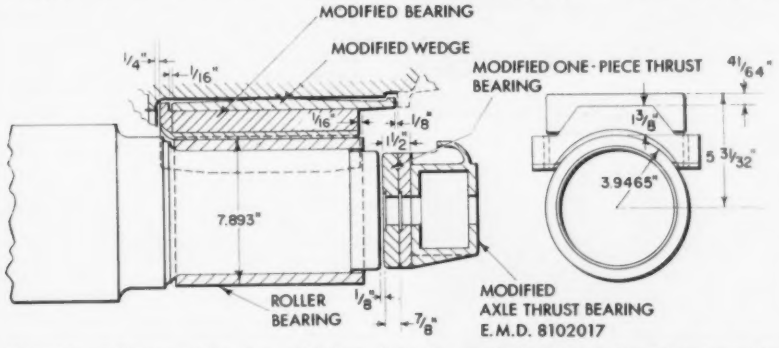
STANDARDIZATION and lower maintenance costs were possible when the Great Northern substituted roller-bearing axles and races for the original solid-bearing axles on 15 EMD 600-hp and 1,200-hp yard switchers. New solid bearings, which ride on the roller-bearing races, are now used on these locomotives. According to the GN's chief mechanical officer, the result is a reduction in wheel protection stock, particularly at smaller locomotive terminals. He estimates a savings of some $70,000 in material inventory, and says that the problem of suitable replacement wheel sets is greatly simplified.

The GN has 90 EMD yard switchers (600- and 1,200-hp) with 40-in. wheels and 15:62 gear ratios. All of these units were originally equipped with 6-½ x 12-in. solid bearings and switcher-type journal boxes. More than 400 other road and road-switcher units also have the 40-in. wheels and the 15:62 gear ratio. However, all these locomotives have 6-½- x 12-in. roller bearing journals. It was decided to use the roller-bearing wheel-and-axle sets, complete with races, under the yard locomotives.

Modifications permit solid bearings to ride on the inner races of the substituted roller-bearing axle. The changes made were:

- Removal of ⅜-in. from the bottom edge of the inner journal box lugs;
- Increase in the radius of the journal bearing surface to fit the O.D. of the roller bearing race;
- Reduction in bearing wedge thickness by 0.084 in.;
- Increase in thickness of switcher-axle thrust bearings by brazing on a ⅞-in. extension.

New patterns now incorporate these modifications because the program will eventually involve a considerable number of brasses and wedges. This is a close clearance of the dust guard over the inner race, but the application can be made without difficulty. After more than two years of service, no troubles have been experienced with the thinner bearing wedge. The GN will modify the remaining EMD switchers and is considering the application for Alco units.



Assembly of thinner wedge, new solid journal bearing, and altered axle thrust bearing make possible use of axles with the inner roller-bearing race applied as a journal surface. Initial conversions had ⅞ in. thickness of bearing material brazed to original thrust bearing. Later bearings are 1 ½ in. thick initially. Journal box needs to be altered only by removing ⅜ in. from bottom edges of the inner lugs.

Locomotive Accidents Were Down in 1959

Director's 38th annual report to ICC shows condition of fleet

An increase of 69 per cent in locomotives ordered from service by ICC locomotive inspectors was revealed by the annual report of the Director of Locomotive Inspection. In 1958, inspectors had found 8.8 per cent of all units inspected to be defective, and ordered 372 diesel and electric locomotives out of service. In 1959, 10.3 per cent of the locomotives inspected were found to have ICC defects, and 628 diesel and electric units were ordered out of service.

Summaries of inspectors' reports indicate that diesel engine components, sanders, brake equipment and fuel systems are most frequently found defective by ICC inspectors. "If the reported defective parts shown by tables are considered," the director commented, "those parts which may be expected to require most maintenance will be indicated, and inspection and repair programs may be set up accordingly."

Sixty-six accidents, resulting in 90 injuries, were caused by the failure of locomotive components during the fiscal year which ended June 30, 1959. For the third straight year, no fatalities resulted from any of these accidents.

"Of the 66 accidents," the director reported, "17 were caused by the defective condition of floors, steps and passageways of diesel-electric locomotives. Twelve of the 17 resulted from accumulations of oil on walking surfaces of the locomotives, a reduction of six as compared with the preceding year. Twelve accidents were caused by defective condition of cab seats, compared with eight in the previous year."

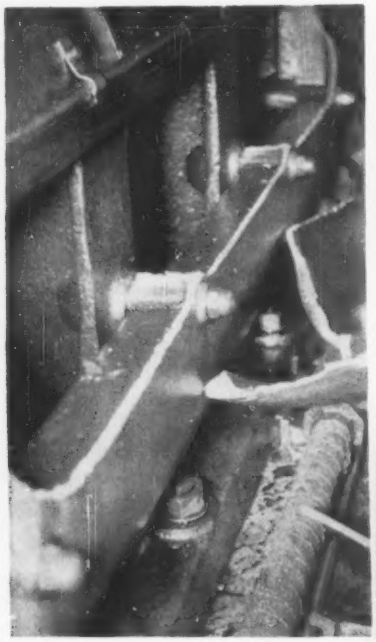
During the year, nine crankcase explosions resulted in ten injuries. An armature bearing failure on an electric locomotive resulted in injury to 24 persons in a single accident.

Accidents and Resulting Casualties Caused by All Locomotive Failures

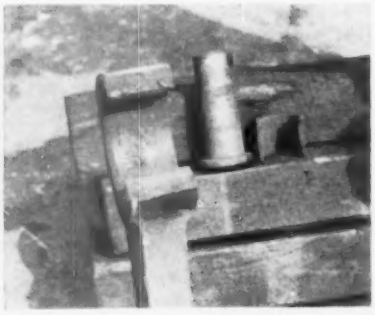
	1959	1958	1957
Accidents resulting in casualties	66	72	75
Casualties (all injuries):			
Train crew members	67	73	76
Maintenance employees	1	0	0
Other employees	1	1	2
Non-employees	21	12	12
Total casualties	90	86	90

How Frequently Do ICC Inspectors Find Defects on Diesel and Electric Locomotives and MU Cars?

	Locomotives		MU cars	
	1959	1958	1959	1958
Units reported	31,862	31,755	2,717	2,728
Units inspected	102,149	91,522	2,231	1,747
Units defective	10,473	8,067	362	168
Total defects	31,171	20,668	834	272
Percent defective	10.3	8.8	16.2	9.6
Ordered from service	628	372	4	1



Crankcase access cover was damaged from crankcase explosion, resulting in one injury.



Diesel-electric unit was removed from service by a district inspector because of broken eye in a truck spring-plank hanger.

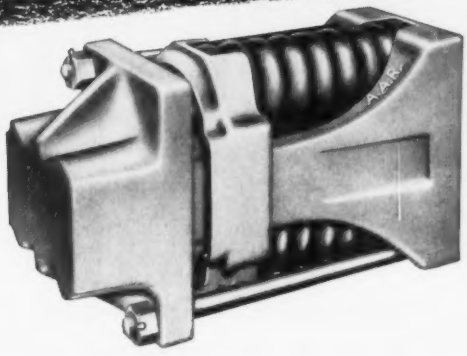
Cab seat failed at the weld joining inner sleeve of seat stand to seat frame plate.

Most Common Defects on Diesel and Electric Locomotives

Partial list of parts defective, inoperative or missing, or in violation of ICC rules found during inspection of 102,149 units in 1959 and 91,522 units in 1958.

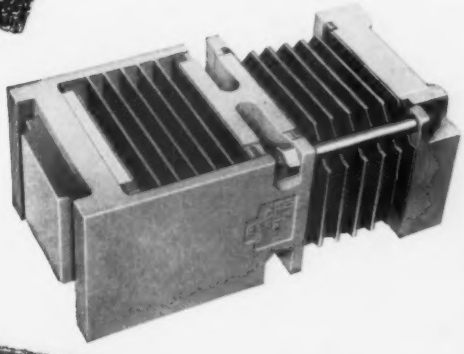
	1957	1958
Air compressors	232	337
Boilers	172	313
Brake equipment	2,460	3,477
Cabs and cab windows	962	1,419
Cab floors, aprons and deck plates	2,020	2,768
Controllers, relays, circuit breakers, magnet valves and switch groups	348	613
Draft gear	357	489
Fuel system	2,307	3,343
Gages or fittings, air	166	277
Handholds	217	230
Inspections and tests not made as required	623	682
Insulation and safety devices	228	210
Internal-combustion engine defects, parts and appurtenances	3,817	6,555
Jumpers and cable connectors	306	355
Lights, cab and classification	321	480
Motors and generators	472	787
Sanders	2,310	3,613
Springs and spring rigging, driving and truck	380	542
Steps, footboards, etc.	202	408
Trucks	510	823
Wheels	189	382
Miscellaneous	762	1,491

IMPACT PROTECTION
with NATIONAL DRAFT GEARS



M-17A
National AAR Approved M-17A Friction Draft Gear provides lading protection in the lower range of impact speeds. Can be applied with Type E and F couplers.

MF-400
National MF-400 Rubber Draft Gear protects car structures against damage at today's high impact speeds. 65,500 foot-pound capacity in conventional 24-5/8 inch pocket reduces center sill stress as much as 42%.



A-980A

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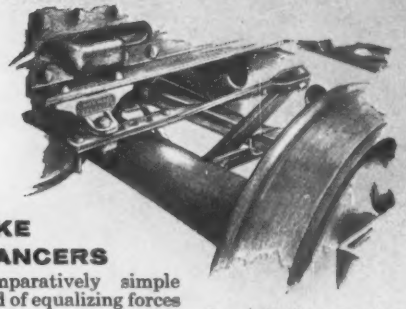
The nation's railroads are noted for many great transportation achievements . . . one of the most important being the efficient handling of the country's heavy bulk freight.

Since 1912, The Wine Railway Appliance Company has designed and manufactured many of the important parts of hopper, gondola, flat and box cars that make this handling function possible, as well as profitable, for the owners and users of the cars. In the years ahead, Wine will continue, through its experience, engineering know-how, and manufacturing skills, to keep pace with the needs of the railway industry.

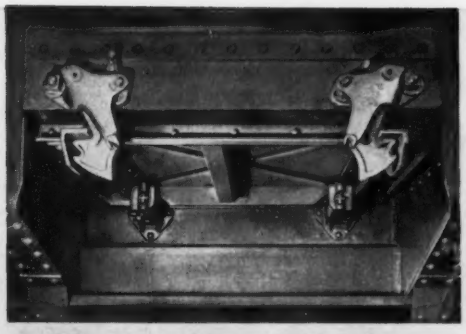


BRAKE BALANCERS

A comparatively simple method of equalizing forces and "balancing" the conventional brake arrangement by replacing the dead lever connection to the truck bolster with the Wine Balancer—connected to the car underframe. A bracket and connector at each end of the center sill flange, engaging the dead lever, balances the brake forces by returning them to the underframe of the car.

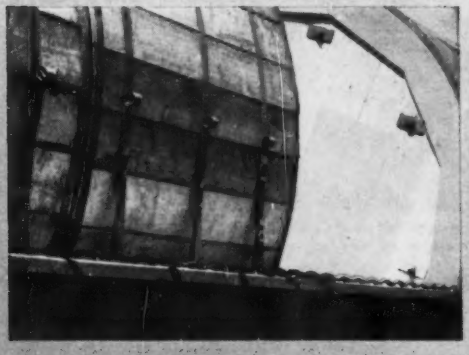
CORRELATED HOPPER UNITS

The one-piece, cast steel frame unitizes each individual hopper into a structurally sound, functional assembly which assures positive door fit. The adjustable locks, cast steel hinges, and symmetrical tapered door flange make possible the *only* adjustable door fit permitting compensation for wear or common irregularities of construction. "Balanced" unloading is assured by dual door operation and a method of controlled flow.



DROP BOTTOM SPRING HINGES AND ADJUSTABLE LOCKS

Drop Bottom Gondolas equipped with these two Wine products provide the shipper and receiver of the lading with a positive closure and afford a fast, economical one-man operation, with selective single or multiple opening of doors.



CONTINUOUS LADING BAND ANCHOR

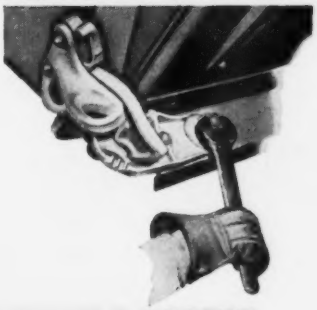
Wine's continuous offset bar for top-coping applications provides a secure anchor for lading bands every 7½" of its entire length. Permits the use of all types of banding material.

DROP END LOCKS AND END BALANCERS

The *complete* drop end combination from operating and security standpoints! Interlocked corners provide rigidity to keep the sides from spreading under load. The balancer incorporates the hinge function . . . permits a one-man, time and labor saving closure.

UNIVERSAL LADING BAND ANCHORS

Easily applied on all flat cars and gondolas, the Wine Universal Type Anchor features 360° rotation for tie-ins from any direction. Versatility of use permits welding on coping at important locations as well as mounting in the floor. Drop flush when not in use.



ADJUSTABLE HOPPER DOOR LOCKS

The adjustment feature allows compensation for construction differences and readily permits adjustments necessitated by wear. Wine Adjustable Hopper Locks are adaptable to built-up, structural hopper openings as well as cast steel frames.

THE WINE RAILWAY APPLIANCE COMPANY

WINE®

DIVISION OF UNITCAST CORPORATION

TOLEDO 9, OHIO

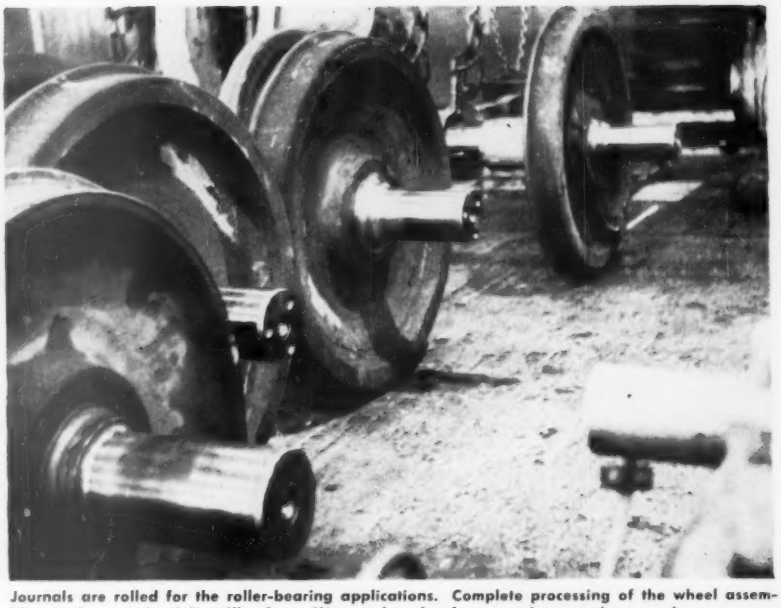
On Elgin, Joliet & Eastern . . .

Switchers Get Roller Bearings

Several Elgin, Joliet & Eastern 2,000-hp Baldwin road switchers and one 1,000-hp EMD switcher are now equipped with journal roller bearings. "Twenty months of trouble-free performance on the Baldwin equipment has sold us," the EJ&E reports. "Elimination of lubrication and maintenance costs to date has made the conversions particularly attractive."

Application of bearings to the six-wheel Baldwin trucks started in April 1958. The first set of EMD four-wheel trucks was converted in February 1959. The service record parallels that of the Baldwins.

Before these locomotives had roller bearings, daily inspections and oilings of pad- or waste-equipped boxes were required. Brasses and lubricating pads were removed and inspected annually, with about 50 per cent of the brasses being renewed at this inspection. Hotboxes and scored journals caused delays and were costly.



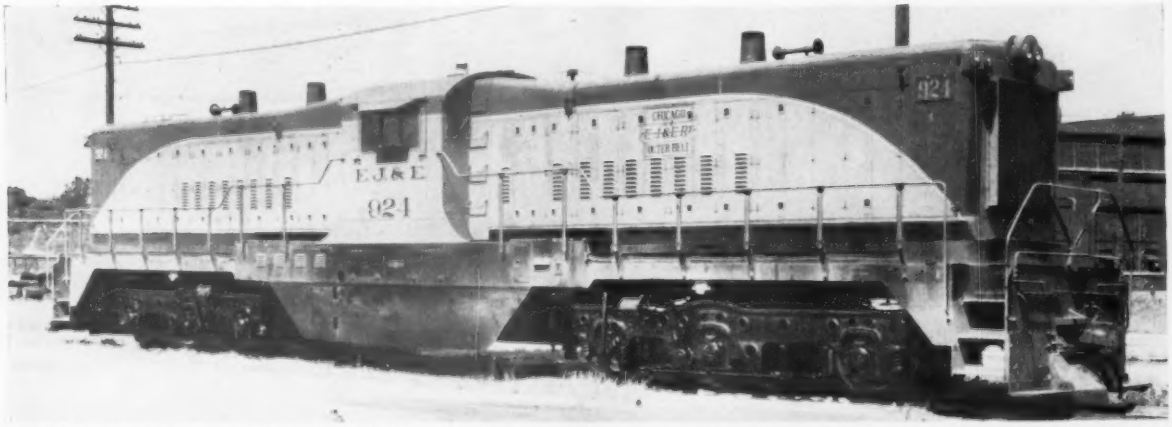
Journals are rolled for the roller-bearing applications. Complete processing of the wheel assemblies is done at the Joliet, Ill., shop. Worn axles, due for scrapping, can be reused.

Cost Kept Low

Expense of the roller-bearing conversion is kept low. Many axles that otherwise would have been scrapped because of wear were salvaged by machining for the roller-bearing races. A considerable number of the road's 132 units are scheduled for future applications as the trucks come in for regular overhaul.

One change is made in the standard 6½- x 12-in. heavy-duty Timken AP bearing. The axle end cap is now equipped with a 1½-in. plug, in place of the original ½-in. filler plug through which the bearing is lubricated. This makes it possible to use the wheel-truing machine without removing the entire end cap, thus protecting the bearing from damage and dirt. The cast-steel journal-box adapters are designed to take either a semi-elliptic spring band or equalizers. Only one pattern is required for the EMD and Baldwin trucks.

Frame adapter and equalizer pocket was designed by EJ&E for Baldwin and EMD trucks.



Baldwin road switchers are work horses of EJ&E fleet. Program now under way will probably see all these units equipped with roller bearings.

Pete's Double Trouble

By Ken Wright

Pete, the grumbler, had just arrived at work one morning when a very disconcerted man met him. Wearing the worried look was Big Jim, the boss. A defective mechanical refrigerator car had arrived in town about midnight and the night crew had been working on it for several hours. They had gotten no place, and the car's temperature was slowly rising. This reefer was equipped with dual systems. One of the units was working, but the other was not. Big Jim told Pete that the car was on the repair track and that he would send someone to help.

After Pete had changed his clothes, picked up the tool kit and started to the car, he met George, his assistant for the job. "I've nothing to start on except that half the refrigeration apparatus isn't working," Pete told him. "So, we'll have to start from scratch if we don't have to re-do what the night gang messed up!"

George took a look at the car temperature dials and remarked that they had better get something done quick because the temperature was still rising.

Pete followed George into the machinery compartment. George pointed out that Compressor No. 2 was not running, and that both receivers showed an ample supply of refrigerant. Receiver No. 2 had more Freon than No. 1, but Pete said this was normal because the No. 1 compressor was running and No. 2 wasn't.

To check the control circuit, they opened the electrical cabinet door and found the wiring diagram. "This should be easy to trace out," Pete said. "Get the voltmeter, George, and let's check the continuity of this compressor circuit. Compressor No. 1 is running, so we are not concerned with it.

"Notice that the No. 2 compressor motor starter contactor is not energized." Pete was pointing to the starter in the electrical cabinet. Now he returned to the wiring diagram. "This coil marked C-2 is the operating coil for the No. 2 compressor starter. If you notice, there are six contacts in that circuit. Two are overloads marked OLCP2. Undoubtedly the night gang tried them, but you press them, one on each side of the starter. OK? Now that leaves us four contacts. There could also be broken or loose wires or a defective coil.

"Be careful," Pete warned. "That voltage is 220 a-c and it's HOT. Down at the bottom of the panel you have a terminal strip; is your voltmeter set on the 300-volt scale? Put one of the prods on X2 and the other on terminal 10." (Terminals are indicated on the wiring diagram as dotted circles.) "Now you see it registers, so that means current can flow from X1 through TD-1 (time delay relay) and TD-2. Now take a reading from X2 to terminal 11.

"The meter indicates a circuit and tells us that TH-2 is closed. That tells me that the thermostat is calling for the second step of cooling. Now take a reading from X2 to terminal 12. OK? That tells us that the circuit is complete through the High-Pressure cut-out switch for compressor No. 2. In other words, we don't have high head pressure. Now read from X2 to terminal 13. What; no reading on 13?—Check again.—OK, back to 13. —With no reading on the voltmeter means the circuit is open between 12 and 13. That is the low-pressure cut-out for No. 2 compressor. That means the compressor has pumped the low side down. Refrigerant is not reaching the compressor."

Pete was still looking at the wiring diagram and more or less thinking out loud. "Wait a minute, George; check the circuit X2 to 14. OK; we have circuit there. That's this solenoid circuit SOL-2. That tells us that the circuit from terminal 12 through the R-1 contact to terminal 14 is OK. Therefore, we should have a circuit to the solenoid valve. Move over there where the driers, solenoids and expansion valves are. How can you tell which one is the No. 2 system?"

"That's easy," George said, "the No. 1 system has frost at the expansion valve because it is working. There is no frost at the No. 2 because it isn't working."

"OK, George. Now take a wrench and take the seal cap off the bottom of No. 2 solenoid. See that stem? That is a manual operating stem. Screw it in slowly and carefully. If you turn it up too far, you can damage the diaphragm. This type of valve can be manually opened, but cannot be manually closed."

George turned the stem in about three full turns before any results were obtained. Suddenly a snap was heard, and Pete looked at the electrical panel. The No. 2 compressor starter had become energized. Pete started feeling the pipes at the compressor and announced that the compressor was running.

George wanted to know what happened, so Pete explained. "Apparently the solenoid's operating coil is defective. We have traced the circuit out to it, but the valve does not open. Take your wrench and touch the top of the coil. Now try the other solenoid. There seems to be magnetism in the No. 1 solenoid but none in this No. 2. If there had been magnetism in both of the coils, it would mean that the valve, itself, was defective. When it didn't open, the compressor pumped the low side down to the setting of the low-pressure cutout. When you manually opened the solenoid, refrigerant flowed through, raising the pressure on the low side. The low-pressure cutout closed, completing the circuit to the compressor starter, and the compressor started. Now we have to see if we can get a replacement coil. Take the information off the coil and we'll see if we can get one."

"But, Pete, won't the car work OK with the valve manually open?"

"Well, first look at it this way. There must be a reason for this electrically operated valve. If it would operate OK with the valve blocked open, then it would have been silly to use it in the first place. Yes, it will function all right, except in defrost or heating. When the equipment goes into defrost or heating, the solenoids close and the compressor continues to run until they pump the system down. With the solenoid manually opened,

This is the twelfth article in this series discussing the operation, maintenance and trouble shooting of mechanical refrigerator cars.

that compressor will not pump down and stop. That means that the system will be trying to cool and heat at the same time. The car has been loaded for some time and there is little likelihood that the equipment will call for defrost. If necessary, we could send it on and report it by wire so everybody could keep an eye on it."

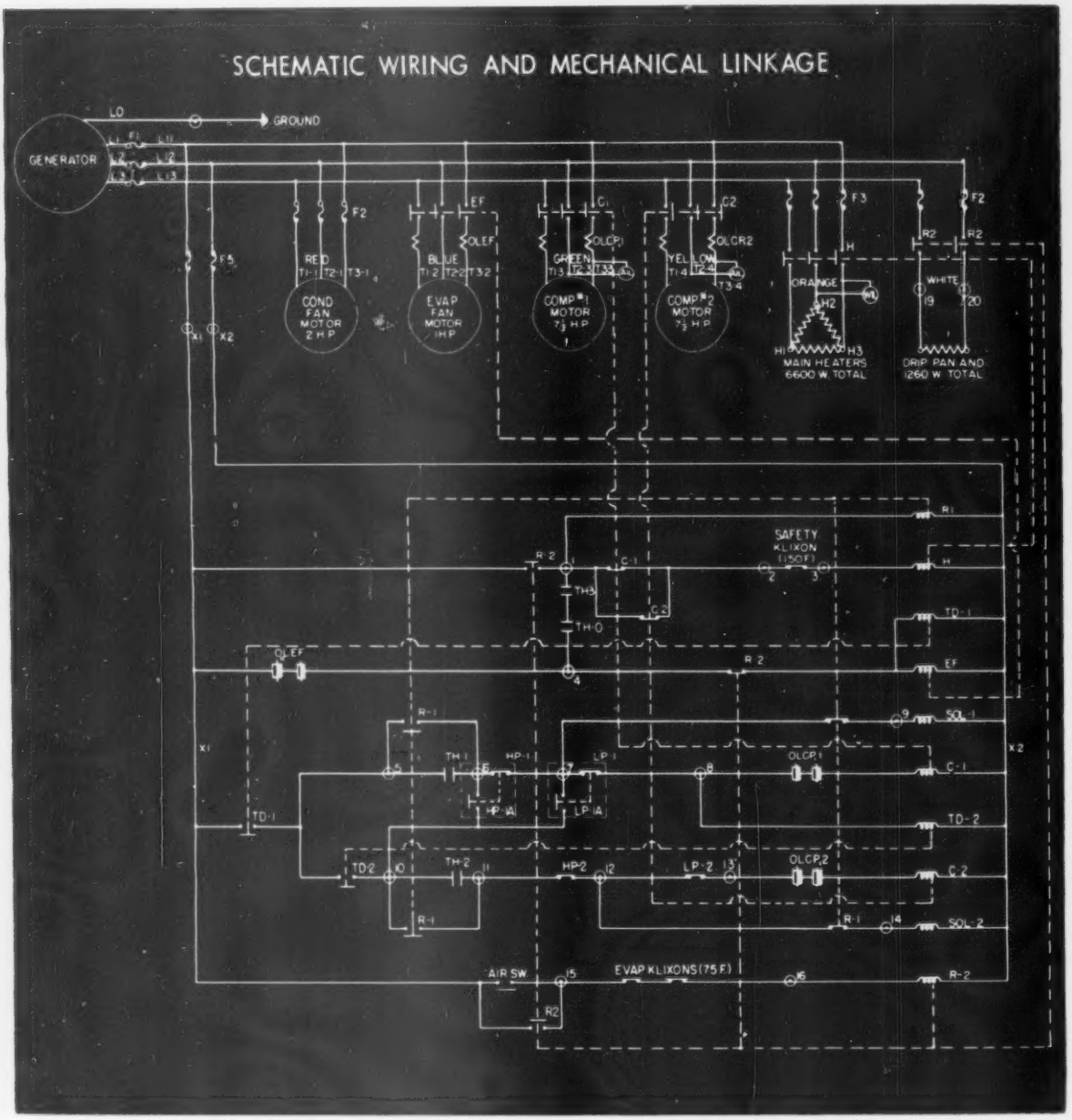
The two fellows checked their stock and didn't find the proper coil. They then called the local refrigeration supply house and found one. When they returned to the car, they found frost on the line from the solenoid through the expansion valve and into the bulkhead. George called attention to this.

"Oh, you got excited when things started. You only have the valve part way open," explained Pete. "It's acting like the expansion valve. Just open it a little more and it will be all right."

As George turned the stem in a little more, the frost between the solenoid valve and the expansion valve began to melt off. They stopped the engine so they could work on the electric circuit. There was no other practical way to shut off the power. When they reported to Big Jim that the car was ready, Pete asked: "Jim, what did those night guys do? I couldn't see anything that they had done; at least I didn't have to put anything back together that they loused up."

"Well, Pete, maybe they were good enough to know not to touch anything unless they were sure of the results."

Big Jim was in better spirits now that the car was fixed, so he felt like needling Pete a little. Pete muttered something and left.



Wiring diagram for Carrier 66-E equipment was checked by Pete and George in course of trouble-shooting the refrigerator car. Dotted lines indicate the mechanical linkage between electrical components. Circuit was found to be open between terminals 12 and 13.

Why spend the money to machine your own roller-bearing axles?

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New equipment and realigned operations at our Johnstown, Pa., plant are helping us meet the growing demand for roller-bearing axles, thus sparing the railroads the heavy investment in finish-machining and grinding equipment needed to produce their own axles.

Bethlehem is set up to manufacture the two most common roller-bearing axles in freight use—AAR Standard and Alternate Standard. Facilities are also available for the complete finish-machining of roller-bearing axles for passenger cars and diesel locomotives, as well as plain-bearing freight car axles.

Join the swing to anti-friction rolling stock. Bethlehem engineers will be glad to discuss your needs with you. Just call or drop a note to our nearest sales office, or write to our headquarters at the address below.

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BETHLEHEM STEEL

Inside length of new caboose is 30 ft and length over pulling faces is 39 ft 4 in. From rail to top of running board the height is 11 ft 9 in.

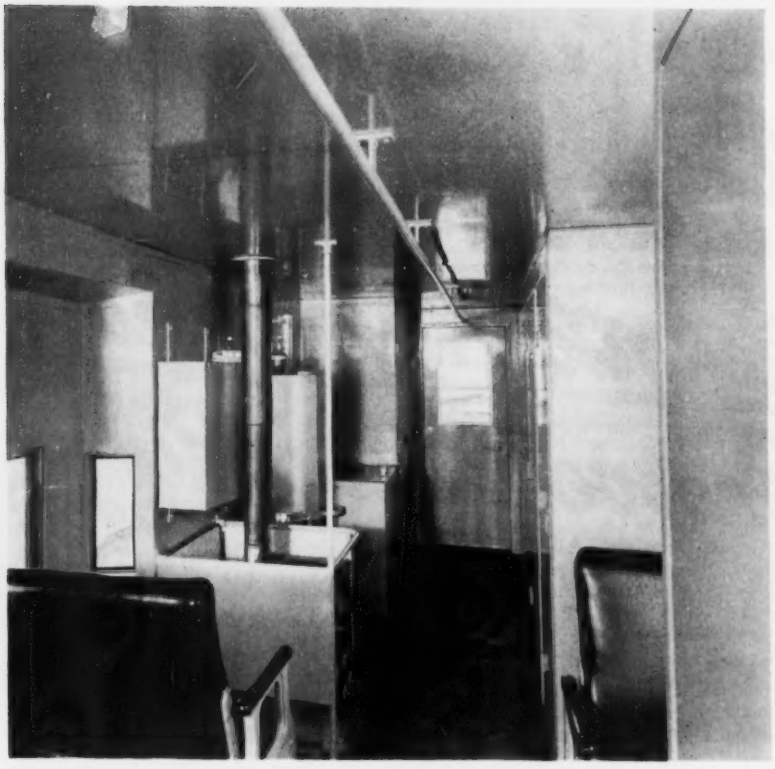
C&NW Caboose Deliveries Begin

Acquisition of 150 new cars will permit retirement of many older cabooses. Pooling will be adopted on through runs

BAY WINDOWS, adopted as standard by the Chicago & North Western some fifteen years ago, are features of the 150 all-steel insulated cabooses currently being delivered by the Thrall Car Manufacturing Company. While ease of maintenance and spartan simplicity characterize the cars, nothing has been overlooked to provide essential needs for the crews. Many of these cabooses will be used in pool service, eliminating the older, wood-sheathed cars from all C&NW time freights.

The underframe is all-welded construction with cast steel center fillers, striking castings and forged rear draft lugs welded and riveted in place. The center sill consists of two AAR Z-26, 41.2-lb sections. Side sill angles (5 x 5 x ⅜ in.) are welded to the body end sill, body bolsters and crossbearers. Body end sills are formed ¼-in. steel. Body bolsters are ⅜-in. plate welded to the center and side sills, covered at the top with a ½- x 28-in. plate extending the full width of the car, and reinforced at bottom with two ½ x 24-in. cover plates. Bolsters are reinforced above the Atlas side bearings with an inverted V pressing welded between the bolster web plates. Four ¼-in. crossbearers are welded to the center and side sills and reinforced with ⅜- x 8-in. top and bottom cover plates. Four 4 in. 8.2 lb Z-bar crossties extend from side sill to center sill. Underframe accessories include ASF bottom-operating couplers, Miner CR-3 rubber draft gears, and Y-40 yokes.

The standard diagonal roof panels are 14-gage galvanized steel. The side plates are ZU design. Four 6-in. 25-lb H-beam collision posts extend from the roof body and car line angles to bottom of body end sill. The four ¼-in. W section corner posts extend from the platform to the side plate and are welded in place. Six Z-27, 5.1-lb. framing posts on each side are spaced to suit window locations. Sides, fabricated from 12-gage copper-bearing steel, were assembled in a jig and welded. The bay window sides were welded in a jig and the two sections assembled into a one-piece side which is welded to the side posts, side sills and side plate. The 16-gage copper-bearing steel inside lining is fastened to the posts and carlines with Huck bolts. This method may be changed on later cars so the entire roof can be lifted off the car for necessary repairs without disturbing the inner ceiling. Roof run-



Steel-lined interior is fitted with toilet enclosure and series of equipment lockers.

ning boards and platform steps are supplied by Blaw Knox.

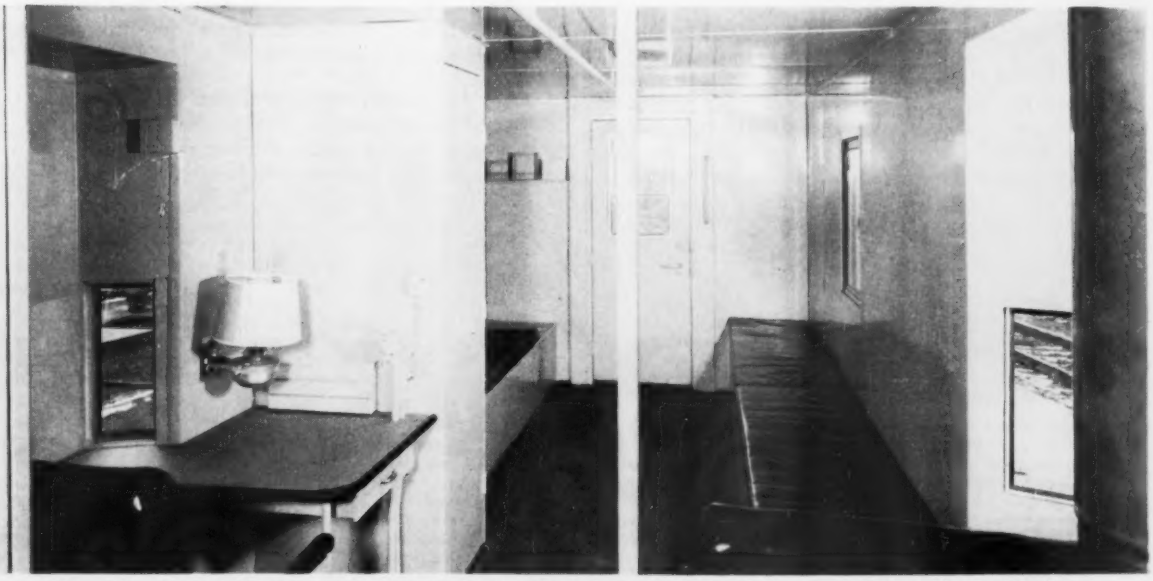
The double construction floor consists of 2 x 8-in. tongue-and-groove yellow pine laid crosswise of the car and secured with three watertight bolts through each plank. Over this sub-floor is one coat of paint, one layer of siselcraft paper, and a 1- x 4-in. tongue and groove fir floor, blind nailed to the sub-floor. One coat of filler and a coat of red non-skid deck paint is applied throughout the car.

Gustin Bacon Ultralite 3-in. insulation is applied to the sides, ends and roof and held in place with Nelson welded pins and clips. Before the insulation is applied, the inside of the side sheet is given one coat of Bondura cement from side plate to side sill. Doors are Met-L-Wood and are equipped with Adlake raise type aluminum sash, screens and safety glass.

Each car has a coal stove and one Aladdin kerosene lamp. Bunks have 3-in. hair-filled cushions with vinyl covering. The tops are hinged to provide separate foot lockers. Bay window seats are walk-over type. One double and one single clothes locker are provided. Other equipment in the car includes a dry hopper, icebox, Giessel water cooler, stainless steel washbasin and one 32-gal wash-water tank. Kerosene lamps are installed over the washbasin and in the toilet compartment.

Each bay has one raise window and two stationary windows. Three horizontal sliding windows are in the sides of car. All movable windows are equipped with Adlake aluminum sash, screens and safety glass.

Trucks are Barber-Bettendorf swing design, 40-ton capacity. They are equipped with 5 x 9 axles, one-wear wheels, lubricator pads, and DO dust guards. Equipment furnished by the North Western includes walk-over seats, wheels and axles, reconditioned air brake equipment and some coal stoves, dry-hoppers and the wash-water tanks.



Inside width of car is 8 ft. Over bay windows the outside width is 10 ft 7⅜ in. Interior was arranged for comfort and simplicity.

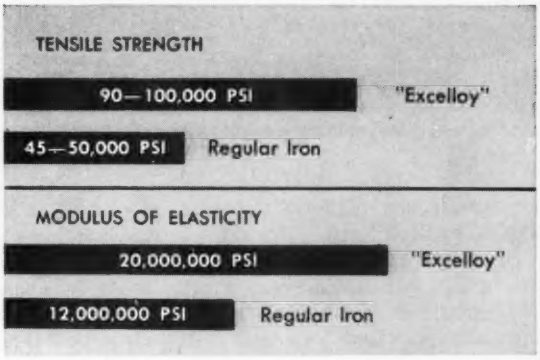
Pedrick Has High Strength Alloy Metal for Top Groove Piston Rings

Supercharging of diesel engines is increasing because of the desire for more and more horsepower at minimum extra cost. This trend is evidenced both by the conversion of engines already in service and by the designing and building of supercharged engines at the factories.

Piston rings which are made of conventional piston-ring iron, and which are used in top-grooves of supercharged engines, frequently do not stand up under the heavy loading of high-output engines and breakage occurs. To prevent this, Pedrick uses a high-strength material called "Excelloy" which is centrifugally cast, highly alloyed and heat treated. This material is about twice as strong as regular piston-ring iron. The tensile strength is 90,000 to 100,000 compared to 45,000 to 50,000 psi. The modulus of elasticity is about 20,000,000 compared to about 12,000,000 psi.

The use of high-strength alloy to stop ring breakage in top grooves is a new development for high-output large-diameter engines. It has been thoroughly proven, however, by many years of service in heavy-duty engines used in trucks, buses and tractors.

Pedrick top-compression rings made of this high-strength alloy metal have an extra-heavy plating of chrome on the face which is pre-lapped or run-in at the factory to assure positive and quick ring seating for minimum break-in time.



So, for greatest protection against top-ring breakage in high-output engines, for maximum scuff resistance, quick run-in and longest efficient life, specify Pedrick chrome-plated rings centrifugally cast of "Excelloy" high-strength alloy metal. WILKENING MANUFACTURING CO., Philadelphia 42, and Toronto 2.

Pedrick PISTON RINGS

PEDRICK PIONEERED *Conformable* RINGS FOR BIG-BORE ENGINES

New Problems in Freight Car Interchange

This is the twenty-second installment of a series of questions and answers on the Association of American Railroads Code of Rules Governing the Condition of, and Repairs To, Freight and Passenger Cars for the Interchange of Traffic which may help car men clarify their understanding of the philosophy, intent and requirements of the Interchange Rules. The answers given to the questions are not to be considered interpretations of the Rules of Interchange, which can only be rendered by the Arbitration Committee acting officially. The comments, however, come from a background of intimate association with the application of the rules. Obviously, comments or opinions as of today may be inapplicable after a revision of the rules or further interpretations by the Arbitration Committee.

What new requirement with respect to location of angle cocks on freight cars became effective on January 1, 1960? (238)

Under the provisions of Paragraph (a) (7) of Rule No. 3, all conventional type cars built new, rebuilt or receiving Class 1 general repairs must be located as specified in page E-26 of the AAR Manual of Standard and Recommended Practice.

What were the reasons for modifying Manual page E-38 and adding new Paragraph (a) (7) to Rule 3? (239)

Because it was found in the absence of proper and definite requirements in this respect that cars were being built and maintained with angle cocks in locations varying to a considerable extent. These conditions resulted in a considerable amount of costly damage to air-brake hose as well as train-line breakages, not only in cases of passing couplers, but also in many instances, where extreme installations were involved, in the ordinary functioning of the draft-arrangement on cars coupled in impact operations. When all of the freight cars in question eventually have angle cocks located as specified in Manual page E-38, all of this costly damage will disappear.

Why was new Paragraph (5) (7) prohibiting the use of coatings with asphalt base material for underside of roofs of box cars added to Rule 3? (240)

Because of damage to certain kinds of lading caused by drippings from such coatings.

When cars are built new, rebuilt or repainted, what consideration must be given with respect to the stenciling of reporting marks and car numbers thereon? (241)

The reporting marks (initials) assigned by the AAR to each individual car owner must be stenciled on the cars along with the number, as outlined in pages L-37 through L-39-E of the AAR Manual of Standard and Recommended Practice.

What important changes pertaining to the design details of freight cars were added to the first part of Rule 3 in the 1960 Code? (242)

New second paragraph and new note were added to provide for the control of new designs of trucks and component parts of freight cars as well as the establishment of an Advisory Board to deal with new car designs and details.

What committees and departments of the AAR are represented on the new Advisory Board and what will be its principal duties? (243)

The members of the new Advisory Board were selected from the Arbitration Committee, the Committee on Car Construction, and the AAR Research Department. This board will furnish helpful advice to sponsors of new and untried designs of freight cars, trucks, and major component parts of carbody where strength, interchangeability of the parts and the general utility of the car are involved. (See Circular Letter issued by the AAR Mechanical Division under date of January 4, 1960.)

Why is it important at this time for supervisors and other forces who engage in the preparation of billing repair cards to make a thorough review and study of Rule 9 as revised? (244)

So as to familiarize themselves with the present requirements concerning information which is to be shown on billing repair cars in connection with the simplified form of billing concerning the large number of "applied" prices now included in Rule 101.

Does the repairing line suffer any loss in cases where it removes journal lubricating devices and repacks the journal boxes involved with regular journal-box packing? (245)

Yes. Under the present provisions of Section (t) of Rule 17 the repairing line must allow the car owner 100 per cent of value new of such lubricating devices in such cases, regardless of condition.

Why is it advisable to stock all repair tracks with a suitable supply of center-plate liners of appropriate thicknesses as outlined in the second paragraph of Section (d) of Rule 20? (246)

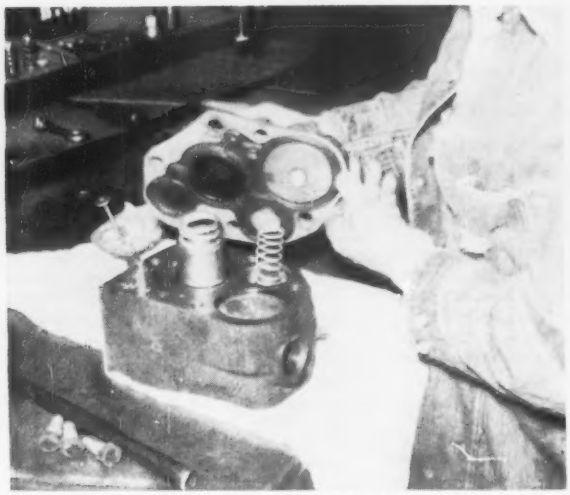
Because this simple and inexpensive type of repairs will correct tight side-bearing conditions, eliminate wearing and gouging of bottom center-plate bowl into the plate portion of top center plate and provide better swiveling of trucks by reason of reduced friction. Such repairs are now chargeable versus car owner and they can readily be made in cases where cars are jacked for any reason.

Under what conditions is charge versus car owner now permissible for in-date testing of air-brake equipment on cars? (247)

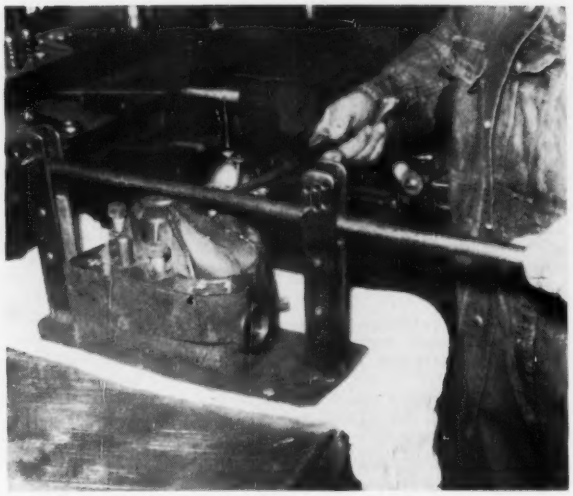
As outlined in Paragraph (b) of Rule 61 and in new Item 25 of Rule 111.

This 88-ton gondola, built by Baldwin-Lima-Hamilton, has been designed to handle copper concentrates and other ores without loss due to leakage. It will be demonstrated on the Southern Pacific and the Santa Fe, making a 6,000-mile tour that will take it to major ore processing centers. It may also be tested handling bauxite and wood chips in Northern California and Oregon. To eliminate the tendency of materials to adhere to sides when emptied, the sides of the new car have been sloped slightly outward at the bottom. A steel blade welded to the ends of each door extends up into the body of the car and acts as a knife or scraper along the end plate. A special paint further reduces stickage. Special rubber seals are fastened to the inside of the door plates along three sides of each door to prevent leakage. The light weight of the car is 63,000 lb; its capacity, 950 cu ft.

DM&IR Jig for AB Valve Covers

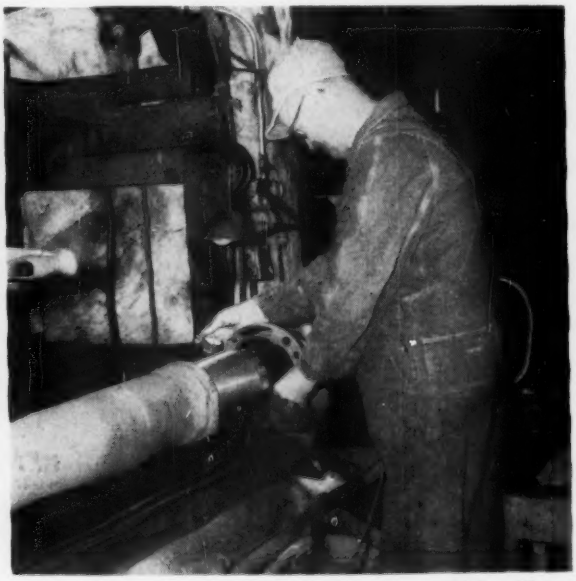


The Two Harbors car shop of the Duluth, Missabe & Iron Range has developed a jig for applying the cover to the emergency portion of the AB valve. Heavy tension springs in the block must be compressed with equal pressure to prevent the gasket in the cover from being damaged. Assembled in the jig, the pressure on the pipe handle seats the cover and holds it firmly in place while the head bolts are tightened assuring subsequent leak-free air brake operation.



Illinois Central Journal Gage

A dial micrometer specially designed to gage journals and eliminate taking several readings has enabled the Illinois Central to make considerable savings and increase production of axles at its Centralia car-wheel shop. A dial micrometer is attached to a standard micrometer and a dial pin inserted in its base. A special tool-steel surface-hardened anvil with index marks permits the anvil to be set for three common gage sizes— 4½-in., 40-ton; 5-in., 50-ton, and 5½-in., 70-ton. Once the anvil is set, any of the three dimensions a journal has to be turned to provide controlled journal bearing sizes for a particular axle can be instantly and accurately read. Use of this device has eliminated three gages and two standard micrometers.



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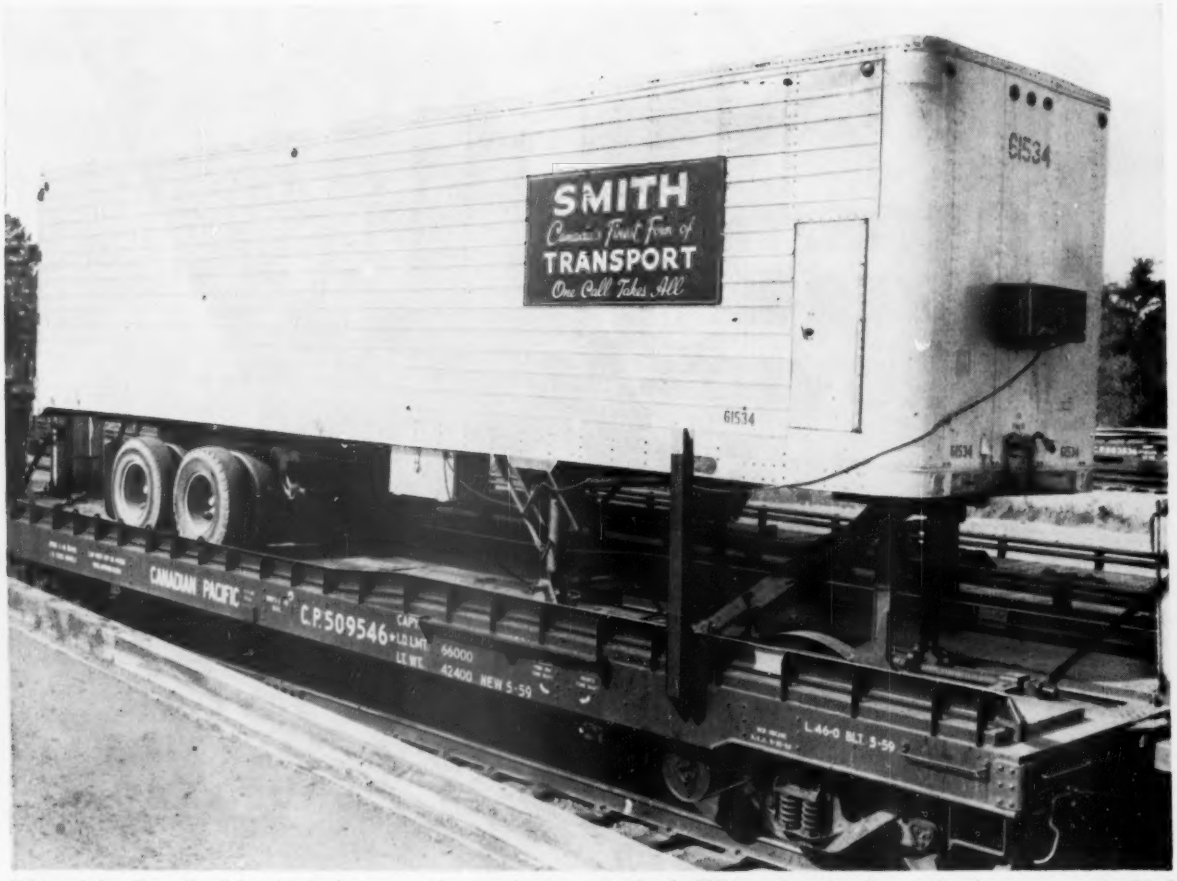

Refrigerated trailers offered for piggyback movement have made it necessary for the CPR to equip series of cars with axle generators. Ventilated box containing regulator and rectifier is mounted on the inside of the car's side sill. Output to run fans is 12 volt d.c.

Axle Generators on CPR Piggybacks

DEMANDS OF PIGGYBACK have resulted in axle generator applications on Canadian Pacific trailer flat cars. The purpose is operation of thermostatically-controlled air-circulating fans on refrigerated or heated common carrier trailers being moved by CPR piggyback. Trailers with Hunter "Econo-Cold" dry ice equipment are most frequently handled. In normal highway operation, trailer fans are powered by tractor generators. Without the tractor, another method of supplying 12-volt d.c. power is necessary.

While the CPR mechanical department was developing a generator, trailers were protected by two 3-cell passenger battery trays weighing 800 lb. They were contained in two battery boxes on the deck of the car. This was cumbersome because the battery boxes could be placed on the car only after the trailer had been loaded. These batteries had ample capacity for overnight runs between Montreal and Toronto, but were inadequate for longer hauls to and from Winnipeg.

The mechanical department developed an axle-end drive using two V-belts to power an alternator. The output is rectified to produce 14-volt d.c. power. An experimental application was made on a piggyback car over a year ago (RL&C, June 1959, p 63). An 18-in. diameter driving pulley, machined and lightened as much as possible, was attached to the roller-bearing end cap and axle by three special studs threaded on both ends to retain the end cap and also mount the pulley.

Flanged plates were inserted in the truck side frame opening and welded together to form a tight-fitting base for the alternator. Lugs for a hinge pin

(*Continued on page 42*)

Diesel generator brushes a problem?

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JOHN PEDLAR

PROBLEM: Serious copper dragging and flashovers.

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RESULTS: This road now considers its generator brush operation completely satisfactory.

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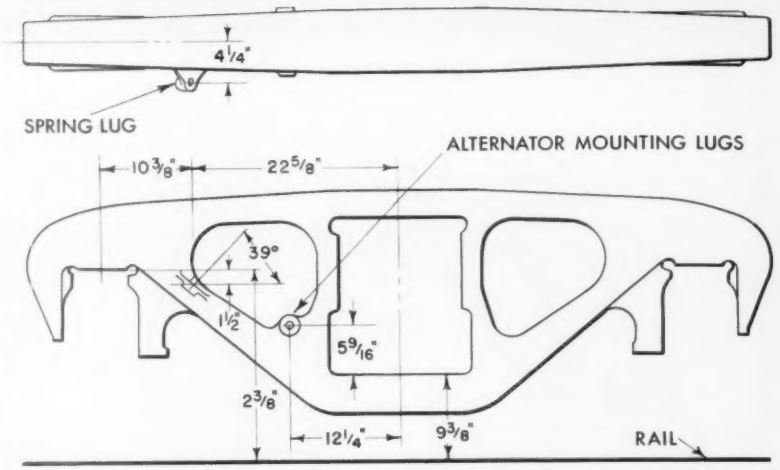
(*Continued from page 40*)

and spring support were welded to this base plate. The alternator support bracket was hinged to the base plate for flexibility, and proper belt tension was maintained by a compression spring. Flexible leads from the alternator were connected to a junction box on the inside of the side sill. The junction box was, in turn, connected to a ventilated box containing a selenium rectifier and regulator suspended under the car. A receptacle plug was applied on the floor of the car in the vicinity of the dolly wheel location.

Trailer owners agreed to equip trailers with heavy-duty 12-volt d.c. truck batteries and cable connector assemblies. It would only be necessary to insert the cable plug from the trailer into the receptacle on the car after the trailer was loaded. The battery would then be kept charged by the generator while the car was in motion.

Six Month Test

The experimental car was tested for six months. Satisfied with the application, CPR had 60 of the 300 cars delivered by the National Steel Car Co. in June 1959 equipped with alternators.



Truck side frames on series of cars getting generators were cast to include lugs for the hinged alternator support and spring seat. New design simplifies the application.

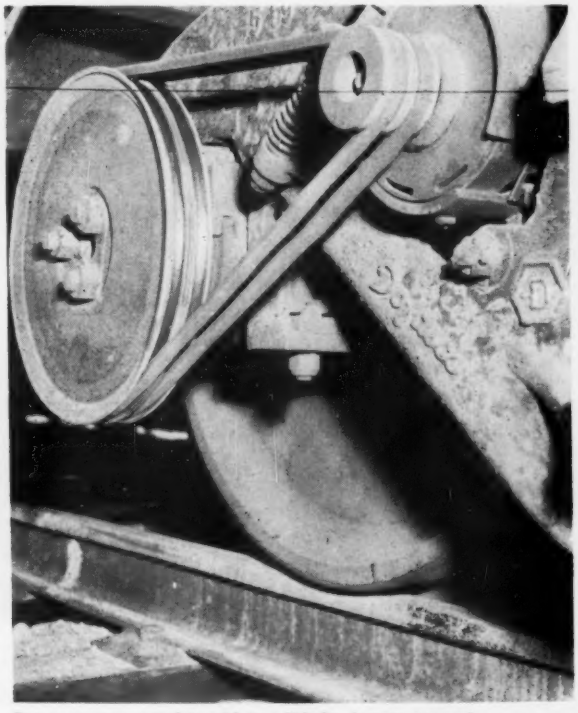
The most significant change was that side frames were cast with integral lugs for the alternator hinge and the spring support to insure pulley alignment at all times. Also, in order to reduce the weight of the driving pulley, two pressed 16 in. diameter pulleys, welded back to back, were used.

A 16-in. pulley with a minimum 5 to 1 drive ratio gives sufficient d.c. output to power three fans in a trailer at 20 mph with an alternator speed of 1,000 rpm. The regulators are set at 13.8 volts with a current setting of 44 amp. The success of the alternator application seems assured. After several months of operation, there have been no failures.

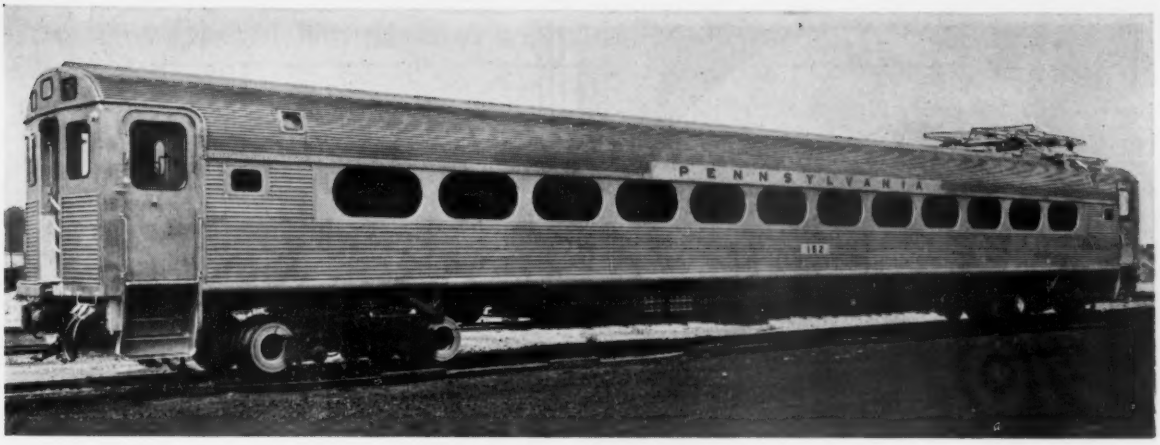
The CPR has expanded its piggyback operations rapidly; they now extend from coast to coast. Its fleet of cars is the largest owned by an individual railroad and includes 600 built in the past two years.

Special studs secure axle end cap and mount driving pulley.

Batteries on trailers are heavy-duty 12-volt type.

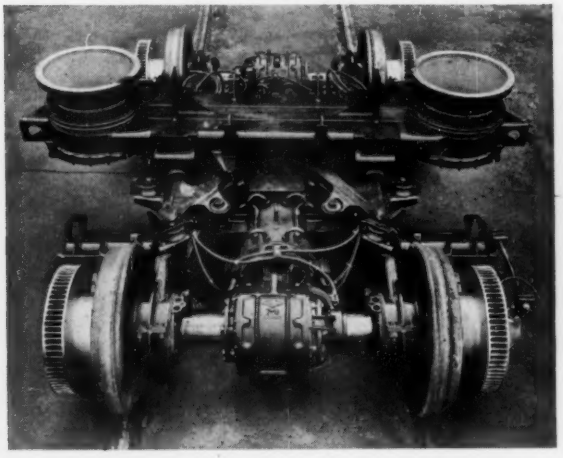


The generator, complete with two V-belts, is very compact.



Spicer Traction Motor Drives Propel The Pennsylvania's Train of Tomorrow

The "Pioneer Suburban", a new 89,300 lb. electric MU car developed by The Budd Company, may prove to be the answer to the Pennsylvania Railroad's challenge for a faster "commuter train of tomorrow." Six of the cars . . . all propelled by Spicer Traction Motor Drives . . . are now serving the Philadelphia suburbs.



Weighing only 23,625 lbs. per pair, Budd Pioneer III type trucks employ two Spicer Traction Motor Drives. These lightweight fabricated trucks have inside frames and bearings and outside disc brakes. Air springs support the car body.

But, it's the compact layout made possible by Spicer Traction Motor Drives that will amaze you! All the cars have inboard frames and bearings and still there's plenty of room to spare. Thus, by employing straight axles, you're free to offset the drive for a multiple gauge design.

Just select the gear ratio . . . from 5.88 to 1 up to 8.9 to 1 . . . that gives you the acceleration you want to match your ideal schedule. Spicer will deliver the complete drive assembly all ready to be secured to the axle without the need of further adjustment.

That means the gears are matched and aligned, then lapped-in under load at the factory . . . to insure the quietest operation for a lifetime of trouble-free service. Finally, the set is lubricated and the housing sealed against leaks. As a result, railway passenger cars equipped with Spicer Drives have traveled up to 1,500,000 miles before needing a major overhaul.

It's simple and easy to use Spicer Traction Motor Drives because you avoid the divided responsibility that comes with a unit that's collectively supplied by a gear manufacturer and a housing fabricator. One call—to the Spicer Service Representative—will bring you the complete help you need and want.

Now's the time to plan cost and weight savings with maximum efficiency through Spicer Traction Motor Drives. Write today for the latest Spicer Technical Bulletin.

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All-Electric Controls

By Gordon Taylor

A group of diesel maintainers on the XY&Z Railroad were eating their lunch and discussing a rumor that some new GP-18 units were soon to be transferred to the Hill Division.

"I understand," said Joe Brown, "that these units have all-electric control and do not have air-operated contactors or reversers. I think we ought to know something about them before they get here."

"Think you're right," said Bill Sparks, the electrician. "I'm going to spend part of my vacation next week with my wife's folks in Centerville. I'd welcome the chance to go to Centerville diesel shop and see what I can learn about these new locomotives."

A few days later, Bill called on Doc Watts, the electrical foreman at the system diesel shop at Centerville. "We understand," said Bill, "that some of the new GP-18 units will be transferred to the Hill Division. We would like to learn something about them."

"What do you want to know?" asked Doc.

"I want to hear something about that all-electric control system. They tell me that all contactors and heavy switchers are magnetically powered. We always understood that it was necessary to have an air-operated piston and cylinder to close a power contactor or to operate the drum-type reversers. It must take very powerful magnets to operate some of the controls. We also wondered how the battery and auxiliary generator on the lead unit can furnish all of the control current needed on the trailing units."

"Well," said Doc, "I'll outline the new control system. Then we can look over some of the units. Builders are always trying to improve their products. Electro-Motive decided to redesign the control equipment to reduce road failures and cut repair costs. In the past, we have had too many failures caused by the fraying and breaking of braided shunts and by worn contacts in exposed interlocks. It was decided to build contactors with interlocks enclosed to shield tehm from dust. The new interlocks do not require flexible leads, which, of course, eliminates trouble with broken leads.

"One basic design of contactor replaces the separate types used in the past for battery field, shunt field, and battery charging contactors," Doc Watts continued. "The battery field contactor makes and breaks the circuit through the main generator battery field. The battery charging contactor makes and breaks the circuit (225 amp maximum) from the auxiliary generator to the battery. The shunt field contractor, of course, makes and breaks the shunt field circuit in the main generator. The use of an extra bus bar and special arc chute places the contacts in parallel on the battery field contactor. On the shunt field contactor, the contacts are in series. The size of the special alloy contacts varies with the current to be carried. All of the interlocks are enclosed to keep them dust-free.

"For the heavy power contactors, a silver cadmium alloy about ⅛ in. thick is brazed on the copper contacts to handle the heavy current requirements of the D-47 traction motors. Alloy contacts will erode and oxidize, but still remain in good condition, because line or point contact areas will carry their current load.

"The old style engine starting contactor was bulky and had braided shunts, copper contacts, and exposed interlocks. The new engine starting contactor is half the size with interlocks totally enclosed. Its contacts are of silver alloy.

"The old-style, four-pole, motor field shunting contactor was an item that used to require frequent repairs. Its function, as you know, is to shunt part of the traction-motor field current through resistance to increase locomotive speed. Copper contacts had to be changed frequently. Oxidation of the copper would cause high resistance through the contact. The sliding finger interlocks were exposed, and the air power cylinder was subject to leaks. Elimination of the air cylinder was a principal target in the new design. When it was done successfully, it marked the beginning of a design program that led to the 100 per cent electrically controlled locomotive. Pneumatic operation was then eliminated from the power contactors, from the brake transfer switch and from the drum reverser.

"The changes made have eleminated many causes of trouble and have reduced the space required for control equipment. The current consumption for the power circuits is the same, but the 74-volt control circuits require about 1/3 kw more current. The speed of operation of the electric power contactor is no faster on pick-up, but much faster on drop-out. The magnet operation makes for a cleaner break. The braking and reverser contactors are faster both ways. Now, does this clear up any of the things you wanted to know?"

"When I get on the locomotive I will have some more questions," replied Bill. "But, what I want to know now is how the auxiliary generator on

(Continued on page 48)

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

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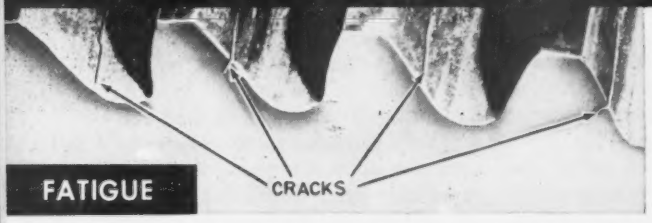
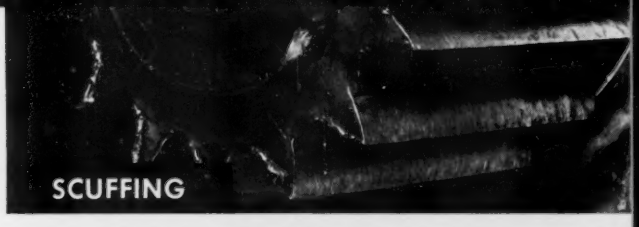
CHECK THESE DANGER SIGNS AND MAIL THE COUPON





FOUR DANGEROUS SYMPTOMS of gear wear can be seen above: *Metal fatigue* results from repeated and long-term load application; *pitting* results from heavy overloads and inadequate lubrication; high-temperature metal-to-metal contact through poor lubrication causes *scuffing;* tooth surfaces become *scored* by particles of foreign matter in the lubricant.

GENERAL ELECTRIC LOCOMOTIVE GEARING is as accurately constructed and thoroughly tested as the finest of machinery. Check your gears at regular intervals to prevent them from becoming a total loss—damaged beyond repair. Not only will damaged gears take your locomotive out of service for gear replacement, but defective gearing often causes traction motor failures.

That's why you can save maintenance dollars if you keep a careful watch on the involute tooth profile. When your gearing starts to show excessive deviation from profile, vibrations produced will damage your equipment. **As soon as profile deviation enters danger area shown on chart above, it's time to let G.E. save your axle gear through expert reprofiling.**

MATERIALS AND PROCESSES SPECIALLY DEVELOPED for transportation equipment are used in manufacturing your gearing. Proper heat treatment assures a tooth surface hard enough to withstand long periods of severe abrasive conditions—yet tough enough to absorb repetitive, high-impact loads. This helps reduce failures and resulting down time for your locomotive. The steel used is a forged, heat-treated carbon steel which provides a hard exterior tooth, blending gradually into a tough, softer, but more flexible core.

STRONG, DEPENDABLE GEARS AND PINIONS form the heart of the locomotive transmission system. The smooth and uniform transmission of driving power from traction motor to axle demands gearing that can stand up to the continual punishment of heavy loads

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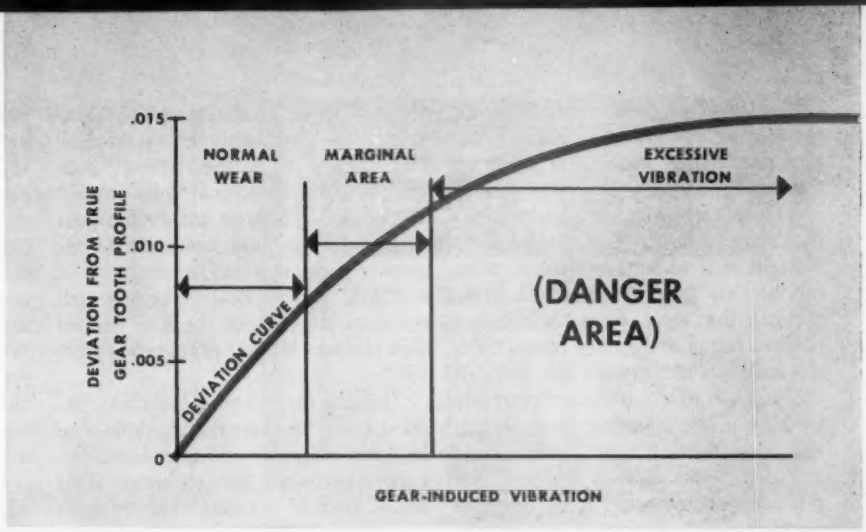
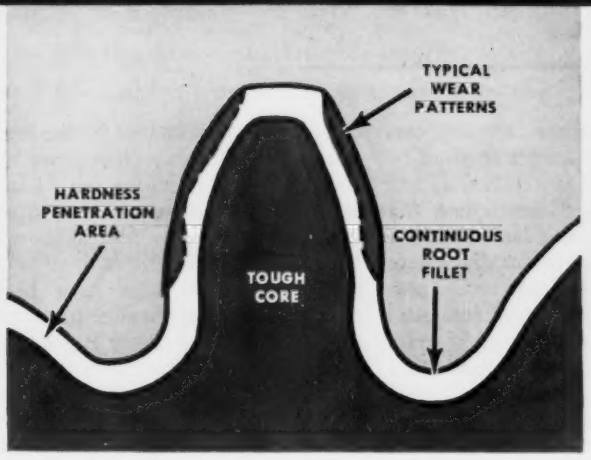
CHART AT RIGHT shows when your gears and pinons are becoming dangerously worn. If the tooth profile has deviated too far from its true configuration, there will be excessive gear-induced vibration. Prompt reprofiling will save your gearing and motor components for many more miles of productive service.



BELOW FOR MORE DETAILS ON WHEN TO RESURFACE



RED AREAS SHOW typical wear patterns on this profile view of G-E gear tooth. Hardness penetration area is a layer of extremely durable, heat-treated carbon steel. Continuous root fillet reduces tooth breakage.

FINAL CHECKS LIKE THIS ONE—using portable involute profile checker—help inspection of tooth profile accuracy.

at high speeds, often combined with sudden starts and stops. To help achieve this high level of performance, the General Electric-designed long and short addendum tooth form and continuous radius fillet provide more strength and longer life. Special protuberance hobbing techniques help to eliminate the danger of grinding cracks in the roots. Special heat-treating techniques also provide a uniform, hard overlayer of steel—containing the desirable compressive residual stresses. G.E.'s manufacturing "know-how," coupled with these advances, helps produce a longer-lived gear to handle today's heavier loads.

When you're thinking of *NEW* gearing—or resurfacing your old G-E gears—contact your nearest Railroad Regional Parts Center or Locomotive Builder. Investigate G.E.'s expert reprofiling service now—before your gears and pinions become too badly worn. General Electric Company, Locomotive and Car Equipment Department, Erie, Pennsylvania.

Section F128-67, General Electric Co.
Schenectady 5, New York

Please send me enlarged version of ready-reference Gear Maintenance Chart (showing types and causes of gear failure). I understand that I am incurring no obligation by mailing this coupon.

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(Continued from page 45)

the lead unit supplies the heavier current required by the new controls on the trailing units."

"That question shows you are thinking," replied Doc. "But the designers thought of it when they went to work on the new control system. It is so planned that the current for coil and magnet frame assemblies comes from the battery and auxiliary generator of the unit on which the contactors are installed. The lead unit controller is not overloaded because, when units are used in multiple, all the contactor power does not come from the lead unit. Pilot relays on each unit receive a signal from the control trainline. When the signal is received, the pilot relay sets up a circuit from the local battery and auxiliary generator, and that circuit supplies current to energize the contactors on that unit. The lead unit in this way simply sets up the control circuits, while the auxiliary generators in the individual units provide the power to actuate the switch gear components in those units. Does this answer your question?"

"Yes," replied Bill. "But now, tell me something about the new control that replaces the old drum type reverser."

"I had expected that question," replied Doc, "because the big difference between magnetic and pneumatic operation of switch gear shows up right there. Instead of trying to apply magnetic power to rotate a cylinder drum, the builder uses four reversing contactors in the GP-9 unit, one for each traction motor. They are essentially double-pole, double-throw switches. They are so constructed that one set of contacts will be open when the others are closed. To reverse direction of rotation, the operating coil is energized to close the contact that was open and to open the contact that had been closed. The magnetically operated contactor has only two natural positions, with a manually selected provision for a fully open electrical circuit. When the reverser is used to reverse rotation of motors, the reversing contactors must remain energized continuously to maintain the power circuit through the normally open contacts."

"If you are ready, we will go out to one of the new GP-9 units with a schematic wiring print. You can get the answers to any other questions. When you get some experience with them, you will no doubt agree that the builder has made a big change in locomotive control."

Super Shock Control

(Continued from page 19)

Coupling forces are said to be so reduced that vertical forces resulting from the impact are greatly diminished.

Service Experience

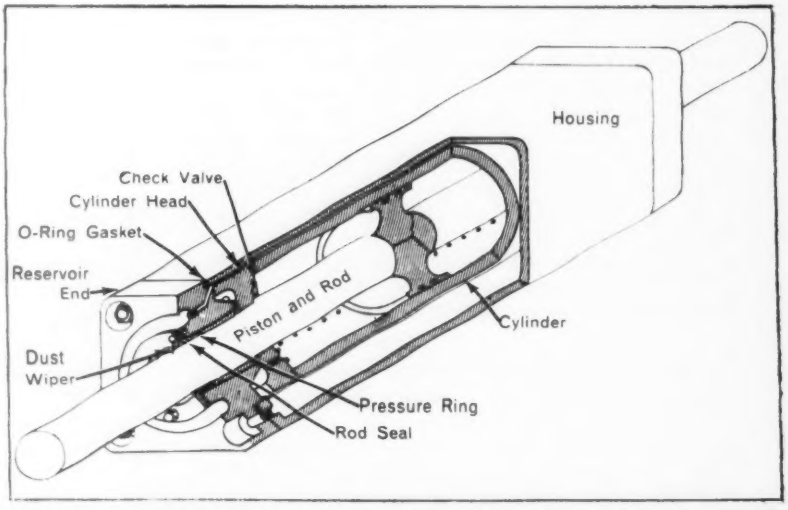
Mr. Blickle reports that no mechanical difficulties have been experienced which indicate there is anything wrong with the 10-in. travel design. Modifications made to the units include improved piston rings and piston rod packing, and revision of the filling and measuring arrangements. A few changes in the design of the outer casing and cylinder heads simplify manufacture.

Information developed indicates that 10 gal of fluid, the normal capacity, should be sufficient for several years of service. Tests show that the device will function with only half of the normal fluid charge, and will give "good" protection with even smaller quantities. The latest arrangement has a bayonet gage in the filling plug to check fluid level. It is reached through an opening in the floor of the car above the unit. In place of special hydraulic fluids, the units now use SAE 10W30 lubricating oil.

Reports on representative shipments made in shock-control cars showed little en-route damage. Of 407 carloads checked, 354 were received by consignees wihout any claims, 24 had claims of less than $10 each filed, and 29 resulted in claims of more than $25 each. Seventy-four commodities were involved in the 407 loads, with a predominance of canned goods, auto glass and windshields, tin plate, lithograph paper, aluminum foil, chemicals and liquor.

After initial tests on the 10-in. underframe applied to an existing car in 1958, a hundred new 50-ft DF cars were put into service. Early last year, 100 existing 40-ft box cars were converted with shock control for handling domestic appliances such as stoves, refrigerators and television sets. Later in 1959, the road built 500 new 50-ft box cars. Currently, Topeka shop is turning out 1,000 more of these 50-ft cars. All 1,700 cars have been equipped with load restraining devices.

The Keystone Railway Equipment Co. has obtained the rights to make and sell the shock-control units. The first applications of the units to cars other than those of the Santa Fe will be made on fifty 50-ft, 70-ton insulated box cars ordered by the Western Pacific from Pacific Car & Foundry.



Double-acting piston and cylinder comprise the "heart" of long-travel cushioning arrangement installed between underframe and sliding sill of Santa Fe Shock-Control freight cars.

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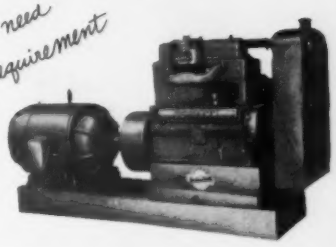

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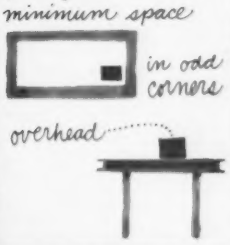
overhead



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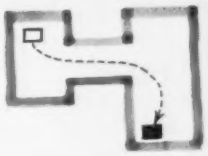

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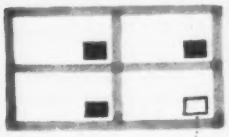

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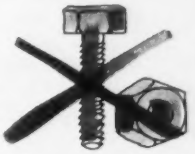

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(*Continued from page 7*)

of large portable containers of all types to reduce transportation costs and handling, as well as the growing interest in piggyback service, now involves materials in the dangerous category. . . . Transportation of cryogenic materials of gaseous nature—liquid oxygen, liquid nitrogen, liquid helium, liquid argon, and liquid hydrogen, increased substantially in the past year. . . .Expanded use of radioactive materials and disposal of waste materials having radiological hazard presented new problems."

Commenting on tank car explosions which resulted in casualties and property damage during the year, the Section stated: "Investigation indicated that no change in tank car design or safety valves could prevent the hazard when cars are involved in severe accidents, where in addition to impact, they also become involved in intense fires."

Charges Set for In-Date Air-Brake Testing

A charge of $2.25 per car has been established for in-date air-brake tests and related work on freight cars, member roads and private car owners have been advised by the AAR Mechanical Division. Item No. 25 in Rule 111 of the 1960 Code provides for the amount, and a new sentence after paragraph (b) of Rule 61 indicates the charge may be made. To justify the charge, the AAR cautions that the complete schedule of work required by Instruction Pamphlet No. 5039-4 Supplement 1 as revised, must be performed.

Personal Mention

Canadian National.—*Montreal:* J. P. VILAGOS appointed supervisor of shop methods.

Duluth, Missabe & Iron Range.—*Duluth, Minn.:* GUY LILJEBLAD appointed assistant electrical engineer.

Georgia Florida.—*Douglas, Ga.:* S. A. MOORE, SR., appointed general car foreman.

Lancaster & Chester.—*Lancaster, S.C.:* W. P. WHITE appointed assistant master mechanic.

Newburgh & South Shore.—*Cleveland:* ROBERT W. KELLER appointed superintendent motive power.

New York Central.—*Syracuse, N.Y.:* VIRGIL E. AYLOR appointed district locomotive inspector. Formerly general foreman at East Syracuse. ROBERT E. FINKE, diesel locomotive inspector, appointed terminal foreman. NORMAN A. OLEY, diesel locomotive inspector, appointed assistant superintendent of diesel terminal. DONALD J. CARHART, relief foreman, appointed diesel locomotive inspector. RAYMOND W. LEAR, JR., gang foreman, appointed diesel locomotive inspector. *Selkirk, N.Y.:* MERRILL P. METZGER, JR., appointed general foreman. Formerly terminal foreman at Buffalo. *East Syracuse, N.Y.:* ARTHUR C. HEARLE appointed assistant superintendent of diesel terminal. Formerly terminal foreman at Rensselaer, N.Y. *Rochester, N.Y.:* RICHARD R. DOUGLAS appointed car foreman. Previously district car inspector at Indianapolis. *Buffalo, N.Y.:* HARRY J. MAJCHRZAK, assistant to master mechanic, appointed general foreman.

Nickel Plate.—*Cleveland:* F. L. ESSIG appointed superintendent car department. Formerly general car foreman at Conneaut, Ohio.

Norfolk & Western.—*Roanoke, Va.:* W. W. OSBORNE appointed assistant superintendent motive power. WALTER A. GRIGG appointed electrical engineer, and ED. H. WERNER, assistant electrical engineer. Messrs. Osborne, Grigg and Werner formerly superintendent motive power, assistant superintendent motive power, and electrical engineer, respectively, of the Virginian at Princeton, W. Va. The Virginian and the N&W merged on December 1. JOHN MARCROFT appointed general air-brake inspector; WILLIAM A. BOSTIAN, shop engineer, and CLAUDE E. FISHER, mechanical inspector. Mr. Marcroft formerly assistant superintendent car department and general air-brake inspector, and Mr. Fisher, engineer tests of the Virginian. C. R. COLEMAN, shop engineer, appointed freight-car-shop foreman, succeeding B. C. COOK. W. H. MORRIS, assistant superintendent car department, appointed general foreman car department, Shaffers Crossing—a new position. *Princeton, W. Va.:* B. C. COOK appointed division car inspector, New River Division—a new position.

Clair I. Clugh

John L. Parker

Pennsylvania.—*Philadelphia:* CLAIR I. CLUGH appointed assistant chief mechanical officer. *Altoona, Pa.:* JOHN L. PARKER appointed manager of heavy repair shops, succeeding Mr. Clugh. Mr. Parker formerly manager, methods and cost control, at Philadelphia.

Mr. Clugh began with the Pennsylvania as a machinist apprentice in June 1918. On leave of absence, he attended Purdue University, graduating as a mechanical engineer. Returning to the PRR, he served successively as enginehouse foreman, assistant master mechanic, and master mechanic of the Philadelphia Terminal Division. He later became master mechanic of the Western Pennsylvania Division and superintendent of the Logansport Division. He was appointed works manager in Altoona in October 1948.

Mr. Parker is a mechanical engineering graduate of the University of Nebraska. After short service with the Union Pacific, he became an inspector in the test department

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of the PRR at Altoona in 1924. After apprenticeship training, he served briefly in office of electrical engineer at Philadelphia and became assistant foreman, Long Island City power plant. He was later foreman and assistant master mechanic on the Delmarva, Middle, Philadelphia, Erie and Ashtabulla, and Lake and Northern Divisions. In May 1945 he became master mechanic of the Chicago Terminal Division, and in 1946, master mechanic at Pitcairn. He subsequently served in top supervisory posts at Altoona, going to Philadelphia in June 1953.

Pittsburgh & Lake Erie.—*McKees Rocks, Pa.:* KARL F. MILLER appointed master mechanic. Formerly district locomotive inspector, NYC, at Syracuse, N.Y.

Santa Fe.—*Topeka, Kan.:* JOHN A. ANGOLD, assistant engineer tests, appointed engineer tests. L. O. TOWNLEY appointed mechanical engineer. Mr. Townley formerly diesel electrical foreman at Barstow, Cal.

Southern.—*Spartanburg, S.C.:* GEORGE L. SOUTHER, JR., appointed manager, Hayne Shop, succeeding AUBREY M. CARY, now superintendent motive power at Atlanta, Ga. *Atlanta, Ga.:* LAWRENCE S. PRESSON, JR., appointed master mechanic, succeeding Mr. Souther. *Columbia, S.C.:* JOHN O. GERSON, JR., appointed master mechanic, succeeding Mr. Presson. *Chattanooga, Tenn.:* JAMES E. WRIGHT appointed general foreman. Appointed general foreman at Citico Shop: PORTER O. FAIRCHILD, JAMES W. ALLEN, SAMUEL N. SISSON, HARRIS C. CHICHESTER, ROBERT M. BARNETT, JR., STEFFIE M. WHEELER, JR., JAMES B. WADDLE, *Charlotte, N.C.:* Appointed general foreman are EUGENE JARRELL (relief) and CHARLES M. JOINER.

Wabash.—*Decatur, Ill.:* BERLYN J. PAYNE appointed general superintendent of motive power, succeeding ELWOOD R. BUCK, retired. Mr. Payne also general superintendent of motive power of the Ann Arbor. A. L. VEITH, electrical engineer, appointed assistant general superintendent motive power, succeeding Mr. Payne.

OBITUARY

H. W. Reynolds, retired mechanical engineer, Norfolk & Western, died on November 27.

Supply Trade Notes

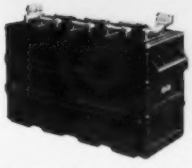
AMERICAN STEEL FOUNDRIES.—*Goff Smith, Lester T. Moate,* and *William V. Covert* elected vice-presidents.

■

DEARBORN CHEMICAL CO.—*Samuel C. Johnson,* vice-president in charge of railroad department at Chicago, appointed vice-president in charge of transportation relations.

■

K W BATTERY CO.—*Keith Steinkamp* appointed general manager, service division. Formerly field service engineer, Exide Industrial Div., Electric Storage Battery Co.



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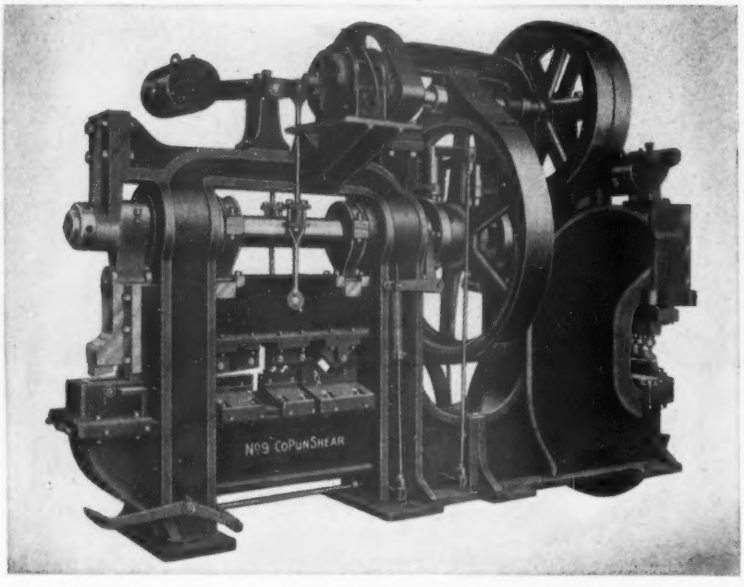

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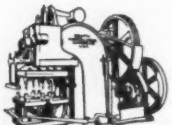

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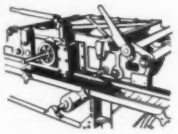

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James Treece
Binks

BINKS MANUFACTURING CO.—*James Treece* appointed manager, Railway Sales Division, at Chicago, succeeding *George Green,* retired.

■

GRIFFIN WHEEL CO.—*J. Ross Drever* elected president, and *Robert H. Wellington* and *C. Fred Strom,* vice-presidents.

■

GENERAL STEEL CASTINGS CORP.—*Thomas C. Barton,* assistant to vice-president—railroad sales, appointed district manager—railroad sales, western district, at Granite City, Ill. *R. L. Simmons,* sales representative to midwestern railroads, Chicago, transferred to eastern district roads, with headquarters at Eddystone, Pa. *Carlo T. deMarco* appointed sales representative, eastern district roads. *P. Taylor Bryan* appointed sales representative, western district.

■

HUNT-SPILLER MANUFACTURING CORP.—*Raymond C. Schleihs,* sales representative, western territory, appointed general sales manager at Boston, Mass, succeeding *Frank W. Lampton,* retired.

■

ANACONDA WIRE & CABLE CO.—*E. J. I. Davies* appointed manager — railroad sales, with headquarters at 20 North Wacker Drive, Chicago.

■

RANSOME CO.—Ransome has acquired complete welding positioner business of the *Worthington Corp. Paul Galton* is general manager of the new Ransome company at Scotch Plains, N.J. Mr. Galton previously general sales manager, Worthington Plainfield Division.

■

AEROQUIP CORP.—*Victor Emery* appointed general sales manager, Industrial Division, at Jackson, Mich.

■

FAIRBANKS, MORSE & CO.—*Roger M. Murray,* manager, San Francisco branch, named vice-president in charge of newly estabilshed Pacific Coast sales region.

■

DANA CORP.—*P. J. Mazziotti* appointed manager of research and development, and *Myron M. Schall* and *Orville E. Phelps* appointed assistant managers of research and development. Gerald F. Fox, sales engineer at Toledo, Ohio, transferred to West Coast area.

OBITUARY

WILLIAM C. KRAUTHEIM, chief mechanical engineer, General Steel Castings Corp., died Dec. 29, in his home at St. Louis.

Letters

Power Costs

TO THE EDITOR:

The editorial page in December issue was very thought provoking to all who are interested in motive power for railroads. The article, "A Yard Stick for Power Costs," holds challenges for the locomotive builders and for the operating roads.

The first challenge is for the builder to produce diesel units of greater horsepower rating. That development is now under way and, no doubt, units of greater capacity will be in use in the near future.

The second challenge is for the railroad maintenance forces to take better care of units to obtain longer service life. Your article states: "Data now becoming available indicates that the economic life of a diesel is not more than 15 years. Similar data shows the electric locomotive to be 30 years." That statement seems to point the finger to the mechanical plant of the diesel unit as being the reason for its shorter economic life. It would appear that the electrical systems of the diesel and the electric locomotive would just about cancel out, as they would be essentially the same.

However, it must not be assumed that all of the troubles in diesel operation are of a mechanical nature. There are far too many failures in the electrical plant. Those power interruptions due to faulty insulation, loose connections, dirt and moisture have no right to exist. Many times when a diesel locomotive fails en route, account of electrical trouble, it will be found that as little as one hour's labor spent in preventive maintenance would have prevented the failure.

Surely it is less expensive to spend an hour's labor to prevent trouble than to haul a dead unit many miles to get attention it should have received in the first place.

This brings us back to the subject of mechanical maintenance. If the present economic life of a 1,500-hp unit is 15 years, what will happen with the new 2,400 hp units if they have to survive under the same kind of care that is given the 1,500-hp units? With 2,400-hp units, it will be possible to operate with fewer units, but, when one of them fails, then 2,400-hp will be lost instead of 1,500.

It seems that the railroads have a challenge to improve their maintenance so that when more powerful units become available, they may secure maximum benefit from them.

There is no economy in spending too much money to prolong the service life of the present diesels, but certainly improved service life can be obtained at costs that better service life will justify. The 15-year figure for service life seems to leave the diesels in the biggest room in the world; that is, the room for improved care and performance.

Gordon Taylor.

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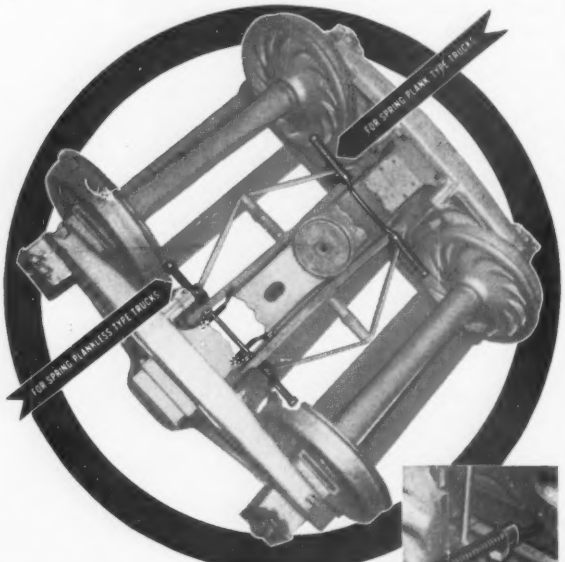

SPRING-PLANK TYPE

The Gripco Brake Beam Safety Support provides the greatest safety at lowest cost. Its dependability has been proven over years of actual service. Gripco Safety Supports are low in original cost, low in application cost and low in maintenance cost, even after years of service.

SPRING-PLANKLESS TYPE
(Safety Loops Included)

ENGINEERING IMPROVEMENTS

1. One design fits both 5'-6" and 5'-8" wheel base trucks.
2. One rod length and one spring length. One interchangeable casting fits both spring plank and spring plankless trucks.
3. Ideal for interchange repairs. New design permits easy and fast applications under all conditions. Nuts need not be removed to apply or remove the support.

OUTSTANDING FEATURES

1. An inexpensive trouble-free support for Rebuilt Car Programs.
2. Designed for spring plank and spring plankless trucks. Spring plankless trucks require safety loops which can be bolted, riveted or welded to the bolster.
3. Supports the brake beam in the event of brake beam or hanger failure.
4. Holds brake beam in horizontal position.
5. Holds brake shoe in proper position in relation to the periphery of the wheel.
6. The brake release feature pulls brake shoes away from wheel contact instantly when brakes are released.
7. Prevents unnecessary wheel and shoe wear caused by dragging brake shoes.
8. GRIPCO supports can be removed and reapplied without removing nuts; therefore nuts are furnished in proper position.
9. Brake beams, rods, and levers are held in position under spring tension thus reducing false movements, chattering and wear of hangers, hanger pins and brake heads.
10. Can replace as a billable repair any support except A.A.R. recommended practice (angle-riveted and welded).

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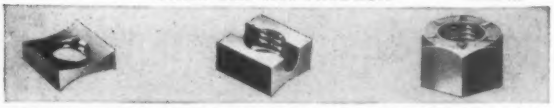
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Reports on Nalco Flange Lubricators Show 50 to 400% Gains in Locomotive Wheel Life

Typical Results Reported with Nalco "Moly-Stick" Dry Flange Lubricant In Railroad Service

Nalco's simple, low-cost "Moly-Stick" Dry Flange Lubricator continues to help operating men cut time, labor and equipment expense for the world's railroads. Developed to cut locomotive wheel flange wear, Nalco Flange Lubricators are showing economies in other aspects of wheel and rail wear problems. For instance:

Ore Car Wheels Wear 50% Less

Recent comparative tests on new ore cars showed greatest wear on left #4 wheels. A Nalco-Lubricator-equipped car showed from 50% to 67% less wear on left #4 wheel than any of the three unequipped cars in the tests.

Reduced Rail Wear

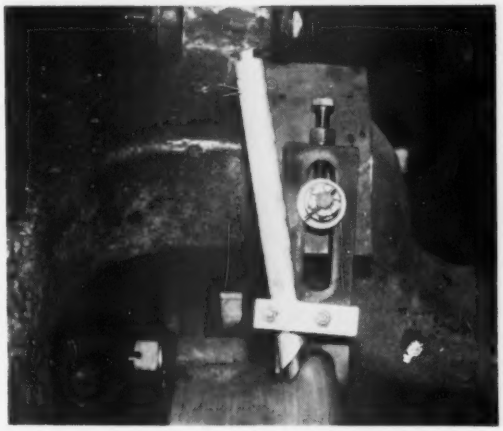
Locomotive installation of Nalco Flange Lubricators showed no flange wear after 70 days' operation—plus the bonus of definite indication of reduced rail wear on curves.

"Annual-to-Annual" Flange Life

This report says: "In most cases locomotives equipped with Nalco Lubricators are going from annual to annual without having to turn wheels for flanges. This was not possible prior to installation of Nalco Lubricators . . . few remaining 'wet' lubricators are being removed as locomotives receive annual inspection, and are replaced with Nalco Lubricators."

New "Moly-Sticks" Average 4000-6000 Miles

Reports indicate that new catalytically cured "Moly-Sticks" have high impact strength and excellent resiliency . . . are giving 4000 to 6000 miles of service. In switching service this long wear life means replacement is normally needed only at monthly inspections.



Nalco Flange Lubricator puts the lubricant exactly where it's needed . . . nowhere else! Stick replacement is extremely simple: Guide shoe retracts, swings out for insertion of "Moly-Sticks", then swings back into position. No nuts or bolts to loosen . . . no tools needed for this quick and easy operation.

Flange Life Upped 400%

"Locomotive has made 9435 miles since Nalco Lubricators were installed. Normal flange life is 7000 to 8000 miles. At the present rate of wear (with Nalco Lubricators) we are going to show better than a 400% improvement."

Installing Nalco Lubricators

Complete Nalco Flange Lubricator protection can usually be installed on a diesel locomotive (8 lubricators) in one man-day or less. Inspection of units and replacement of "Moly-Sticks" is a quick and easy operation.

For complete information about this more effective, more trouble-free method of flange lubrication, call your Nalco Representative today, or write Nalco for Bulletins 571 and 591.

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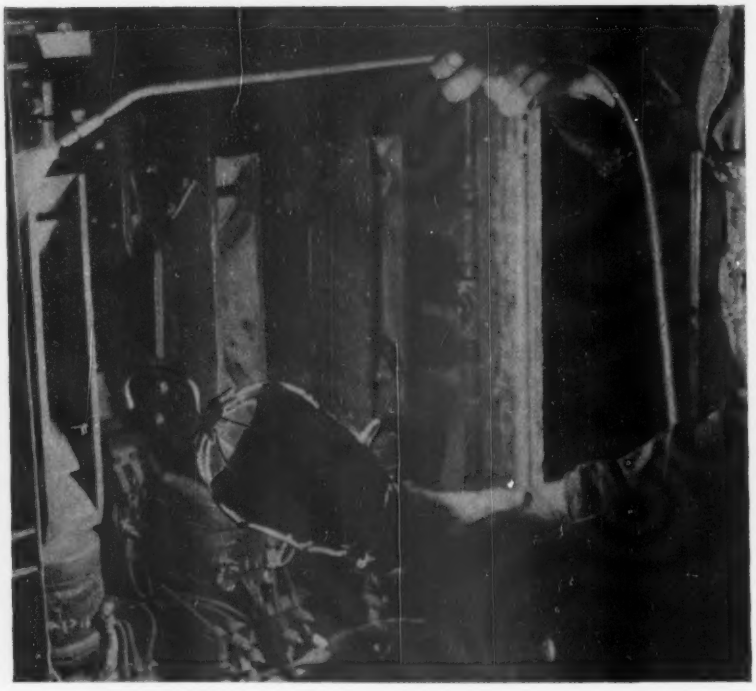

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